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The IDRC

International Development Research Centre

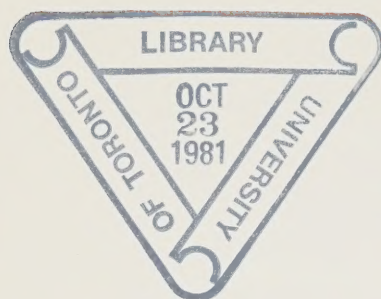
Reports

VOLUME 4 — NUMBER 1

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Our New Look . . .



This issue of *The IDRC Reports* marks another stage in the evolution of the IDRC's regular journal. There have been some major changes: a new format, with separate English, French and Spanish editions; a new look, aimed at making the publication attractive and easy to read; some new features that will become a regular part of each issue; and for the first time the publication has a full-time editor.

The aim of *The IDRC Reports* is to inform and involve. To communicate not only factual material, but also something of the ideas and enthusiasm that are inherent in the activities of the Centre. For the Centre is not a place, nor is it a collection of projects: the Centre is people, people involved in trying to solve many human as well as technical problems. *The IDRC Reports* aims to encourage communication among people. This is not a scientific or academic journal. We aim to be newsy, informative, thought-provoking. For example, in this issue David Spurgeon gives a global review of sorghum research, which is yielding encouraging results at an early stage; two young Chinese women talk about their experiences as "barefoot doctors", a topic highly relevant to the Centre's interest in rural health care delivery systems; soil scientist Dr. Daniel Hillel explains an intriguing discovery in the first of a series featuring people doing research that is supported through the Centre's Human Resources program; and a photo essay outlines a joint attack on "river blindness" in West Africa. Another new feature is *Commentary*, an editorial page for personal opinions on international development issues. We also have independent reviews of two recent IDRC publications, and reports on people and projects from the Centre's regional offices. In future issues we'd like to add a regular letters page, giving you the reader a chance to respond to what the magazine is saying.

In this way *The IDRC Reports* can go beyond being a vehicle for information, it can also provide a forum for discussion.

Bob Stanley
Editor

The IDRC Reports, a magazine about the work of the International Development Research Centre and related activities in the field of international development, is published quarterly at the Centre's head office, and is available on request from the Publications Division.

Established in 1970 by Act of the Canadian Parliament, the Centre is a public corporation supporting research designed to adapt science and technology to the specific needs of developing countries, and concentrating in the following fields: Agriculture, Food and Nutrition Sciences; Population and Health Sciences; Social Sciences and Human Resources; and Information Sciences.

The Centre's Head Office is in Ottawa, and it also maintains four regional offices around the world:

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The views expressed in signed articles in this publication are those of the authors, and do not necessarily reflect the views of the International Development Research Centre.

Cover Photo: Ken Riley

The IDRC

Reports

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If you have this sorghum . . .	
Article by David Spurgeon	4
Going Down to the People	
Barefoot doctors in conversation	7
Onchocerciasis	
The fight against “river blindness” — photo feature	8
Regional News	
Reports from Singapore, Beirut, Bogota	10
Project Briefs	
DEVSIIS — studying information systems	11
A little bit of magic?	
Clyde Sanger interviews Dr. Daniel Hillel	12
Reviews	
Assessments of two new IDRC publications	13
Commentary	
A Time for Intelligent Policies, by M. S. Rao	14

'If you have this sorghum why bother about wheat?'



A review of research aimed at improving the world's fifth ranking cereal crop, by DAVID SPURGEON, director of IDRC's publication division.

One of the two most important staple foods of the 400 million people who live in the world's semi-arid tropics is a cereal grain that has been virtually ignored by agricultural scientists until recently, except by a few in the United States whose efforts have been used primarily to improve it as animal feed.

The cereal is sorghum – a robust, hardy, drought-resistant plant that thrives in warm climates. Although it ranks third after rice and wheat as a cereal for human consumption in Asia and is second only to maize in Africa, in an era of world food shortage sorghum has come nowhere near reaching its potential.

For example, while in the United States in the 15 years prior to 1965 sorghum production was more than quadrupled as a result of the development of hybrids, better management and control of pests and weeds, few of these advances have been transferred to the developing world. At present, the developing world average yield of sorghum is only 705 kilograms per hectare, compared with between 6,000 and 8,000 kg/ha for the high-yielding varieties of wheat and the new man-made hybrid, triticale. Throughout the developed world none of the other major food grains averages less than 2,000 kg/ha. Agricultural experts say sorghum yields could be doubled or even quadrupled in developing countries – and the yield potentially is even higher than wheat or maize.

Fifth in importance among the world's cereals (after wheat, rice, maize and barley), sorghum is an extremely versatile plant. High in carbohydrates, averaging around 10 percent in protein, its grain is ground into a meal from which a porridge is made, or into flat breads or cake. It is used also for making edible oil, starch, sugar, paste, and alcoholic beverages (about 95 percent of South Africa's crop is made into beer).

Sorghum stalks are used as fodder and building materials. Sweet sorghums (sorgos), grown mainly in the United States and southern Africa, are used for forage and syrup. Called Guinea corn in West Africa, kafir corn in South Africa, durra in the Sudan, jowar in parts of India, koakang in China and many other names elsewhere, sorghum is cultivated in the largest quantities in the Far East, Africa and North America. Wide variations exist in the plant types and grain color (from pale to dark red or brown) and consumers' tastes differ with respect to such factors as texture and grain size. In 1970, the Food and Agriculture Organization reported 37,800,000 hectares (93,430,000 acres) planted to sorghum.

The plant was probably domesticated in Ethiopia by 3,000 B.C., spread west and east and then south in Africa. It reached other countries by trade or by drifting over the sea, and was brought to the New World through the slave trade. It was not until its value was seen as a livestock feed that the acreage devoted to it began to increase in the United States. After the development of hybrids, yields there rose spectacularly. But it

has not been easy to adapt these advances to developing nations, where sorghum is a traditional cereal with specific and subtle grain-quality factors, and environmental conditions are often quite different.

Nevertheless, attempts are being made – some of them backed by the IDRC. At the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) at Hyderabad, India, which the Centre helped to found, the basic objectives in sorghum research are to provide good, stable yield with good grain quality. Plant scientists there are convinced that known technology could increase crop yield with existing types of sorghum by a factor of two or three times. And development of high-yielding varieties could increase yield much more.

The scientists at ICRISAT are fortunate to be able to draw for their research on the world collection of sorghum germ plasm, housed nearby at Andhra Pradesh Agricultural University. They have the benefit of the intensive breeding research that has gone on in India for a number of years, and of nearly 16,000 varieties of sorghum germ plasm.

However, inadequate or badly distributed moisture supply and low soil fertility are major factors limiting yield internationally, and neither problem can be overcome by simply improving plant types. Farming methods used in the semi-arid tropics have changed little over hundreds of years, and traditional practices offer little defence against erosion and pay little regard to water conservation. Thus farming systems that make best use of available moisture, that maintain and increase soil fertility, and that

are within economic reach of the small farmer, are a fundamental requirement.

Hugh Doggett, IDRC's associate director, plant sciences, is based at ICRISAT and directs the cereals breeding program there. In a recent paper entitled "Problems and Limitations of Sorghum Internationally," he said:

"Farming systems research at ICRISAT involves a study of the most efficient way of utilizing as much of the rainfall as possible falling on the land within individual catchment areas, without using water from external sources. Secondly, we are looking at cropping systems which conserve water, and which use fertility well."

A number of other problems need investigation to improve sorghum yield, according to Dr. Doggett. One concerns the nitrogen fixing bacteria that occur in the sorghum root zone: there may be cultural methods that encourage their activity, and some sorghum varieties that make better hosts for these bacteria than do others. There are also large differences between varieties in drought endurance, and more study is needed of the root systems and of the capacity of the vegetative tissue to endure stress.

"Perhaps most progress can be made by adjusting length of maturity to match [the] critical stage of crop development (growth stage 2) to the most reliable rainfall period in the distribution," he said.

The second international problem with sorghum is insect pests, according to Dr. Doggett. "Those who live in the developed world can have little realization of how serious pests are to the sorghum farmers in the developing world." Stem-borers are most damaging when growing conditions for the plants are poorest, so the greater the drought stress or the lower the fertility, the more devastating these insects become. Pests such as shoot-fly can be controlled with a chemical, carbofuran, but it is both poisonous and expensive. Midge can also be a problem.

Plant resistance to the pests must therefore be a main line of defence, and fortunately there are some strains available with such resistance. Otherwise, better agricultural practices, which resist pest build-up, offer the best help to the most farmers. These include intercropping, rotation of crops, and sanitation.

Another promising approach to insect control is to use viruses against

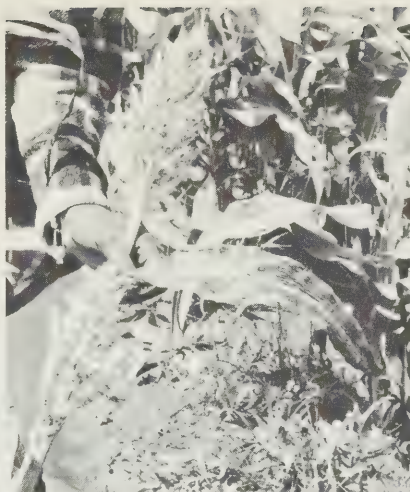


Photo: Ken Riley

This plant is afflicted with bacterial streak leaf disease.

them. There is evidence that viruses can be very effective against certain pests; the production of virus inoculant is a labor-intensive process, and so far can be done far more cheaply in the developing world than in the developed world and without the use of foreign exchange; and the viruses are unlikely to pose a threat to predators that already help control pests.

"Another international problem which inhabitants of the New World seldom appreciate is the devastating damage done by the witchweeds, *Striga* spp," Dr. Doggett says. "These parasitic weeds, indigenous to Africa and India, build up in vast numbers as soon as sorghum is grown too frequently on the same land, without suitable rotation."

Extensive areas of arable land in Africa and some in India have been rendered unfit for sorghum cultivation as a result of the build-up of witchweed. The parasite has minute seeds that can remain viable in the soil for more than 10 years and can only be germinated after an appropriate pre-treatment with moisture at certain temperatures, followed by the action of a stimulant solution produced by the root of the host plant.

Host resistance is important in the defense against witchweed, but it is insufficient to prevent large numbers of the weeds from emerging above ground, flowering, and distributing millions of seeds. Other methods of control include artificial stimulants to germinate the seed in the soil in the absence of their host; "trap cropping," or the growing of a susceptible crop and ploughing it in before the weed has flowered, and spot spraying with herbicides.

Fortunately, sorghum diseases are less of a problem than are pests. Seed-borne diseases, such as smuts, and *Helminthosporium*, which are among the greatest causes of yield loss through disease, can be controlled economically by seed dressing.

Research on how to improve the quality of sorghum grain has been neglected, Dr. Doggett says, because research workers in countries where most sorghum research has been done have been concerned more with live weight gains in ruminants, poultry or swine than with food for people.



Photo: L. R. House

Experts say sorghum yields could be doubled or even quadrupled; this crop of grain sorghum is at Tel Amara, Lebanon.

"I believe that the fundamental question has never been asked, or at least made a matter for investigation, 'why is sorghum a coarse grain?'" says Dr. Doggett. Everyone chooses rice and wheat first, maize is often third, and sorghum next on the list. "The glib explanation of this ranking is to say that rice and wheat are prestige grains, which are eaten by the wealthier classes, and are therefore symbols of success. Sorghum is eaten by the poor. However, these taste preferences are so widespread that we ought to enquire whether this is an adequate explanation."

Dr. Doggett notes that rice, the most highly-prized grain, has virtually no prolamine (a protein fraction); wheat, which comes next on the preference list, has only a moderate amount. Coarse grains, including maize and sorghum, have substantial prolamine. Dr. Doggett suggests breeding sorghums with a low prolamine content to determine the effect this would have on quality.

Evidence suggests adults require only some eight percent of protein in their diet provided the protein is biologically well-balanced, so it may be more logical to breed cereal grains adapted to the needs of the adult population and to supplement children's and infants' diets with other foods rather than trying to produce high protein, high lysine types, he says.

"I suggest that we should look much more carefully at the factors

which distinguish a coarse grain from a quality grain," says Dr. Doggett. "We may well be able to produce a sorghum type which is not despised, but which is valued in its own right for its quality and flavor.

"Certainly there is a most interesting range of material in Ethiopia, where people have depended on sorghum for several thousand years and have selected some very good culinary types. Much collecting needs to be done there still, but one interesting cultivar which came to us recently has a name in the local language which means, 'If you have this sorghum, why bother about wheat?', and it has a distinctly wheat-like flavor. These people in the Ethiopian highlands are also wheat eaters. There is an area here requiring a lot more investigation."

In addition to the work at ICRISAT, the IDRC supports a major program involving 17 countries of West Asia, the Near East and the Mediterranean, known as the Arid Lands Agricultural Development Program (ALAD). This program, like ICRISAT's is also concerned with improving millets and legumes. The program extends from Pakistan in the east to Morocco in the west, and from Turkey in the north to the Sudan in the south. It includes both plant and agronomic research and a training program in which young scientists from each of the countries co-operating spend five to seven months at ALAD's central headquarters in the Beq'aa Valley of the Lebanon.

The trainees select from the large germ plasm bank varieties of cereals and legumes likely to be best suited to their home conditions, then plant them under supervision of the staff. The best strains are selected and returned to ALAD to improve the overall germ plasm storehouse.

The programs at ICRISAT and ALAD are closely linked. In addition, IDRC supports a number of programs in other parts of Africa linked with these efforts. For example, there is a program in sorghum improvement and post-harvest technology in Senegal, a sorghum improvement program in the high altitudes of Ethiopia, and three sorghum, millet and farming systems programs in East Africa. All are linked with ICRISAT and ALAD efforts, and the scientists are brought together from time to time to exchange information and experiences.

"Through this comparatively new device of a central research base that is well-equipped and staffed by first-class professional scientists, linked with a series of mutually complementary national and regional programs all designed to improve these crops of the semi-arid tropics," says J. H. Hulse, director of the IDRC's Agriculture, Food and Nutrition Sciences Division, "we are confident that significant improvements—both in yield and nutritional value—together with greatly-improved systems of farming and land and water utilization, will be forthcoming in the not-too-distant future."

We may well be able to produce a sorghum type which is not despised, but which is valued in its own right.

Ethiopia: this stack of sorghum stalks will be used for firewood or fuel. Wood is scarce so they have quite a high economic value.



Photo: Ken Riley



Photo: Ken Riley

Going Down to the People

Watching them, listening to them, it is easy to imagine that these are simply two intelligent, articulate young North American women. But listen to what they say and you realize that Susannah and Catherine Yeh are different.

Born and raised in China to an American mother and Chinese father, the Yeh sisters are a unique product of the Cultural Revolution. For the past year they have been living, working and studying in the United States, improving their English and talking to people about China. During the Cultural Revolution they joined the millions of Chinese young people who quit school to work in the fields and the factories. Both worked as "barefoot doctors", Susannah by design, Catherine more or less by accident.

In Ottawa recently they talked to the annual meeting of CUSO (Canadian University Service Overseas) about being a barefoot doctor, and much else besides. Here are some of the things they had to say.

SUSANNAH The barefoot doctor movement started among the people working in the communes down south. When I was in high school in 1966 the Cultural Revolution started and the barefoot doctor movement was coming to a pretty high point, so I asked the school to send me to a hospital to learn to be a barefoot doctor. So I joined a group of people at the Chinese Traditional Medicine Institute in Peking.

First they'd talk about human bodies, how human bodies really function. And after we learn everything about our own bodies they start training us in Chinese traditional medicine. We also learned some western medicine, like how antibiotics really function and how you use them. And maybe a third of the time we were learning acupuncture.

After we learn acupuncture we went to the hospital clinics to see how the doctors really train and practice in the hospital. They explained everything to us as we were going to learn as fast as we could, and after three months like that we go into some kind of practice in the hospital, working side by side with the doctors. Some doctors here (in North America) will think "I learned for eight years to be a doctor, what do you know about your body?" But that's something about their ego: they have to control everything.

But in China doctors really know that the barefoot doctors are going to help them, because in China we still need a lot of doctors. And especially if you work with the people you're close to, you really know what's wrong with them.

CATHERINE When we went down to the countryside there was a big movement started by the youth. The youth said let's go down, since we can't decide what kind of education we want, we should go down and enquire from the people and see what they want. And millions and millions of Chinese youth went down to the countryside, went down to the factory to try to find out who is the people and how can we serve them. Or else it's an empty slogan, right?



Photo: Ottawa Citizen

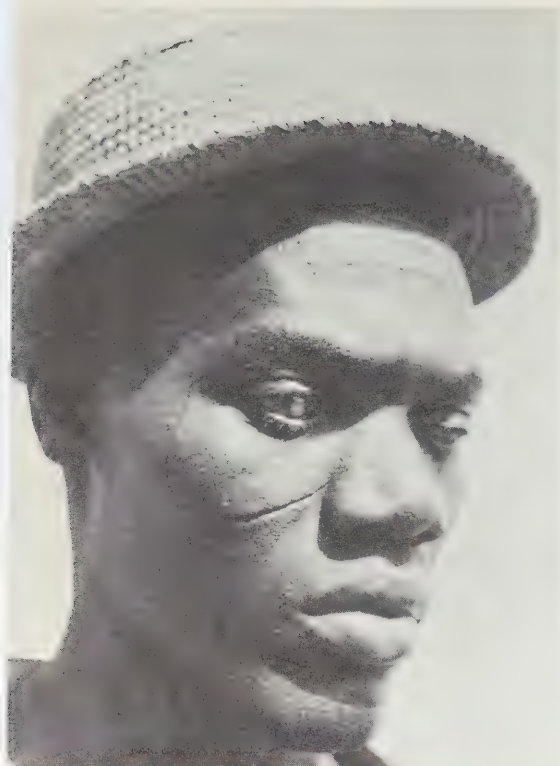
Before I went I was sort of hollow, I had nothing in me, I don't know if I could believe in myself or not because I didn't know the values. I had been taught in books, but not in practice. So when I went there I was pretty scared. I was sixteen and I had never contacted true Chinese working people, but they took me in just like I was one of them, and that was so different from anything I have experienced.

I don't think I should call myself a barefoot doctor, but I did work as a barefoot doctor. My sister bought me the Barefoot Doctor Handbook, it describes every part of your body just like a medical book with common language that everyone can understand, and with pictures so you can see exactly what's happening. So I took it with me and it was tremendous, it was so useful. People come to me with an illness—in the fields during the harvest season people have to rush and lots of accidents happen—I don't know what to do, so I look in my book and try to find out what's happening.

And if I had never been down in the countryside I would never have dreamed I would be the least interested in medical care. I am scared of the responsibility. SUSANNAH I asked to be assigned to the little factories nearby the clinic, because if I am working side by side with the people I can treat them at the same time. I'm a worker in the factory, and when they need some kind of medical help, I help them if I can. Before that if they wanted to see a doctor they would have to leave the factory for maybe a few hours, but now the clinic is in the factory we save a lot of time.

A lot of people ask me about psychiatry in China. We don't have too much psychiatry, we usually don't need them. We have "people psychiatry" and the barefoot doctor is one. But the job is not done just by the barefoot doctors, it's done by the masses in the factory. For example some woman would complain that she had quarrelled with her husband. And everybody listened and tried to help, saying "Yes, you are right," or sometimes "We think you are wrong," and would try to help her understand why.

This has become like some kind of a movement in China, and I really feel the barefoot doctors can only be based on a socialist kind of country because we are not competing. We are trying to help each other, trying to serve the people.



Left: The highest incidence of river blindness is among men between 25 and 40 years of age (Photo: Marshall Laird). Above right: Entomologists Farida Lebtahi of Algeria, Jean-Elouard of France, and Zerbo Doro of Upper Volta, study the breeding ground and life cycle of the blackfly in Ivory Coast (Photo: M. O'Shaughnessy).

Double : 'River B in Wes



Zerbo Doro, entomologist from Upper Volta, dissects blackflies at the field research station in Ivory Coast (Photo: M. O'Shaughnessy).

The bite of the blackfly causes annoyance and discomfort to many Canadians every summer. However, the problems caused by a West African species of the blackfly known as *Simulium damnosum* are much more serious. It transmits a microscopic worm, *Onchocerca volvulus* to human beings. The spread of these parasites in the human body results in the disease onchocerciasis which, in its extreme form, causes blindness. In West Africa alone more than one million people suffer from the disease; 70,000 of them are totally blind.

The blackfly breeds in the fast-flowing streams of the region. Because the people fear onchocerciasis, or "river blindness," they have abandoned about 10 percent of the most fertile land in West Africa, located near rivers and streams. An estimated 2.5 million acres of potentially arable land in Upper Volta and in parts of Ivory Coast, Ghana, Togo, Dahomey, Senegal, Mali and Niger have been left uncultivated because of the menace of the blackfly.



Above: Blackfly lays its eggs on stones and blades of grass. Below: Sketch of Simulium Damnosum.



Attack on 'Onchocerciasis' in Africa

There is a two-pronged drive to eliminate the disease, thus allowing increased food production in the river basins. One is a massive campaign, headed by the World Health Organisation, to eradicate the blackfly vector through the use of pesticides over a period of 20 years. The second is a research program, financed by the WHO, to find a biological means of controlling the blackfly by introducing parasitic worms known as **Mermithid nematodes**. Studies have shown that the introduction of mermithids leads to sterilization or death of significant percentages of blackflies.

Research into the life-cycle of the blackfly vector is being carried out in West Africa by the onchocerciasis unit of the Organisation de Coordination et de Coopération pour la Lutte contre les Grandes Endémies (OCCGE), while at Memorial University of Newfoundland, staff of the Research Unit in Vector Pathology have been studying the breeding habits and physiology of the blackfly, as well as problems of mermithid cultivation under laboratory conditions.



Above: This man catches as many as 500 blackflies per day in glass tubes. They are sent to the laboratory for examination (Photo: M. O'Shaughnessy). Below: Researchers examine blackfly larvae found in a creek near the Memorial University of Newfoundland (Photo: L. Kryski).



NEWS

from the

Regional Offices

Singapore

The Asia Regional Office in Singapore, (known to its friends as ASRO), which is hosting the meeting of the Board of Governors in mid-March, is the longest established of the Centre's four regional offices. The agreement setting it up was signed with the Ministry of Finance on 10 December 1971, and the office started functioning in modest premises belonging to the Singapore Social Science Council.

During 1972 Lang Wong was the sole IDRC representative in Singapore, and it was not until 1973 that the building up of professional staff began.

Then Fanny Araullo, of the Philippines, whose special field is food technology, came from Ottawa to represent agricultural interests. John Friesen, a Canadian who has worked in India and later for the Population Council in Iran, was appointed to cover population and health projects. And Nihal Kappagoda left the Sri Lankan ministry of planning to become regional director.

With this build up, and the recruitment of staff for Technonet Asia—the coordinating unit for eight organizations in six countries that provide technical information to small- and medium-scale industries—the premises in the Social Science Council proved to be too small. So in May 1974 the ASRO shifted to new premises in the Regional English Language Centre (RELIC), which is one of the seven centres of SEAMEO, the Southeast Asian Ministers of Education Organization.

The present staff numbers 29, including nine professionals. Three of them, currently headed by Bill Gall (who was first director of the International Food Technology Training Centre in Mysore, and more recently a CIDA Special Adviser), staff the Technonet Centre. As well, Pedro Flores of the Philippines joined in April 1974 to coordinate SEAPRAP—the Southeast Asian Population Research Awards Program, under which 13 young social scientists have recently been selected for one-year awards to carry out individual projects on population research. With Jacques Amyot, a Canadian anthropologist with many years' experience in Thailand and the Philippines looking after social projects, the build-up of professionals is almost complete.

The support staff are all Singaporeans and, besides efficiency and beauty, command a bewildering number of languages.

Additional space is being obtained on the sixth floor of RELC where the present office is located and, by September 1975, the entire floor will be occupied by ASRO. Thus, in a physical sense, the Regional Office is geared for expansion. Further, with conference facilities, restaurants, and hotel accommodation available in the building, the office can effectively cope with the increasing conference load that is falling on it.

What about projects? Of the Cdn\$48 million of research funds committed worldwide by IDRC up to December 1974, more than 31 percent has been in the Asian region. This large proportion is in part a reflection of the size and diversity of the continent. But an analysis of the 81 projects then approved for funding shows that a majority (59, to be precise)

were centred in the five ASEAN states—Thailand, Malaysia, Singapore, Indonesia and the Philippines.

The Centre's concept of "networking" has been developed extensively in the region. This consists of drawing together research teams from several countries to carry out their national studies in collaboration with each other, so that they can exchange notes on methodology and other experience during the lifetime of the project through regular meetings, and perhaps contribute finally to a comparative study.

Examples of networking in the agricultural and fisheries sector are projects in cropping systems (centred on IRRI in the Philippines, but soon to stretch to Bangladesh and Indonesia), post-harvest technology, cassava (which links teams in Indonesia, Malaysia and Thailand with the focal point, CIAT in Colombia) and fish culture which first projects have begun at Malacca in Malaysia and in Orissa and West Bengal states in India.

In the social sciences, other networks have been formed for a study of low-cost housing needs among eight countries; in regional (that is, sub-national) development, drawing Nepal into a linkage with Thailand, the Philippines and Indonesia; and in a study of the role of hawkers and vendors in six cities. In information sciences, the Technonet association has already been mentioned; while in population work plans are well advanced for collaborative research on fertility control to be undertaken in Singapore, Malaysia and Indonesia and for an East Asia network of social scientists in population research.

With the expansion of program staff, it is expected that the Regional Office will play a greater role in project development than it has done in the past. An increasing need is being felt for the identification of research priorities in each country, and for an analysis of how they fit the broad development objectives of national plans.

As a preliminary to this task, ASRO is soon to start work on cataloguing ongoing research activities in the program areas, and on collecting information on existing research institutions and the resources available to them. Staff will be recruited for this purpose, and they will work closely with national institutions who are already documenting this information in certain sectors.

Thus, in this and other ways already described, ASRO is gearing itself to the future expansion of IDRC, with the increasing amount of decentralization which that process should involve.

NIHAL KAPPAGODA

Beirut

Newest of IDRC's Regional Offices is the office for the Middle East and North Africa, based in Beirut, Lebanon. In operation since the autumn of last year, the office received official blessing in November, when IDRC President, Dr. David Hopper, visited the Middle East for the signing of the agreement between the Centre and the government of Lebanon setting up the office.

Director of the new regional office is Salah Dessouki. Both he and Dr. Hopper were impressed by the interest shown in the countries they visited in harnessing science and technology in the interests of national development.

The office itself is located in a newly-constructed building near the outskirts of the city, just off the airport road. Besides Mr. Dessouki, the Beirut staff includes James Cowie, assistant director; Andrew Ker, representing the Agriculture, Food and Nutrition Sciences division; Joseph Ingram, representing the Population and Health Sciences division; and Ahmed Tawfik, administrative officer. The Information Sciences division will shortly be represented by Shahid Akhtar, presently based at the Centre's Head Office in Ottawa.

Bogota

The Latin American Regional Office — LARO for short — has recently established a Program Support Unit to assist in analyzing the region's research needs. Headed by LARO's former public information officer Mrs. Patricia Mermelstein, the Unit is presently working on an experimental information gathering model to determine the criteria for analysis of national development plans and policies.

The Unit has three objectives: to ascertain the most pressing research needs in the fields in which IDRC is currently sponsoring research; to identify new areas of research needing IDRC support; and to seek out the organizations best suited to carry out the research. Public health in Colombia was selected as the field for a test of the model.

The first phase — the collection and analysis of data — is almost completed. If first results are encouraging, and the methodology proves to be flexible enough, the system may be applied to other countries in the region.

The LARO office in Bogota, Colombia, was established in August 1972 to serve Latin America and the Caribbean. It participates in broad policy-making, identifies specific projects for consideration and supplies information on the region to the Centre's various program divisions. As supporting activities LARO has a library and documentary services, and a Hewlett-Packard computer. A publications and public information office has recently been added, which will be responsible for LARO's periodical and scientific publications, including the Spanish edition of *The IDRC Reports*, as well as for research projects in this area.

Two new staff members joined LARO during the first quarter of 1975; Susana Amaya, of Colombia, as Associate Director for the Publications Program, and José Valle-Riestra, of Peru, representing the Agriculture, Food and Nutrition Sciences division. They join Regional Director Henrique Tono, of Colombia; Associate Director, AFNS, Barry Nestel, of Britain; Jorge Garcia, of Chile, Population and Health Sciences representative; Canadian Nantel Brisset of Social Sciences and Human Resources; Luis Ramiro Beltran, of Bolivia, Information Sciences; and Patricia Mermelstein, of Colombia.



The Regional Office for the Middle East and North Africa in Beirut, Lebanon.

Project BRIEFS

DEVISIS — an International Information System for the Development Sciences — is still a long way from being an operational system, but progress has been made since June 1974 when a meeting in Ottawa of representatives of 28 national and international organizations recommended detailed study of the proposal.

The DEVISIS Steering Committee, chaired by Paul Marc-Henry, President of OECD's Development Centre, held its first meeting in October 1974. Its membership includes eight individuals from different geographic regions of the world and representatives of the co-sponsoring organizations. Assessors representing existing international information systems sit with the Committee. Under an IDRC grant Unesco provides Secretariat support and policy guidance within the framework of its UNISIST program.

The DEVISIS Study Team will work at ILO in Geneva. Its director will be John Woolston of IDRC's Information Sciences Division, while members will be drawn from both the information science and the development communities. The study will take six-eight months; some members of the team will be resident in Geneva; others with experience of information problems in relation to planning in developing centres, will come to Geneva for short periods of time to evaluate the work of the Study Team.

The objective remains the same: a mission-oriented system to provide planners and policy makers with the information they require to make sound decisions on the allocation of resources to economic and social development programs. The information is scattered — in national governments and international organizations, universities and research organizations. Only an international network will be able to

gather a set of information comprehensive enough to be of real value. Management of the system must eventually be in the hands of the international community, a solution that is foreseen in the coming together of the co-sponsors of DEVISIS: at present IDRC, ILO, OECD, UNDP and Unesco.

Preparatory work is needed to identify sources of literature for DEVISIS. ECLA has asked IDRC to support a project to identify organizations in Latin America and the Caribbean which produce literature relevant to the economic and social development of the region. A directory and a computer file of information about the organizations will be produced. A subset of the literature — that produced by economic integration organizations in the region — will be processed by computer and a bibliography and magnetic tape file will become available. The Asian Institute for Economic Development and Planning has asked IDRC to provide funding for a survey of some 300 similar organizations in the ESCAP region. A detailed questionnaire has been developed which may be applicable elsewhere. Both projects result from expressed needs for regional development information systems. Information they provide will also be of value in identifying strengths and weaknesses of national documentation and information services, and of crucial importance to the work of the DEVISIS Study Team.

It is essential that DEVISIS satisfies both national and regional requirements. It is also important that those working at the national and regional levels are aware of international developments. It is these necessities that are shaping the rather unusual organizational arrangements for DEVISIS. These are innovative and only time will allow an evaluation of their effectiveness.

Dr. Hillel's Little bit of Magic

Daniel Hillel held up two glasses of water. Into one he tipped an ordinary clod of earth, which at once began disintegrating and muddying the water. Into the other he dropped a clod which had been coated with a thin layer of silicones. This clod lay like a stone in the bottom of the glass while it was passed round the group, but it crumbled easily between his fingers when he lifted it out of the water and pressed it.

A little bit of entertaining magic? Dr Hillel likes dramatic moments, but he also exercises a scientist's caution. So he merely says it is "an innovation which we believe can be important in the semi-arid regions".

He has been developing this technique of "rainproofing" clods of earth during his year as an IDRC Research Fellow. He is Professor of Soil Physics at the Hebrew University of Jerusalem, and the fellowship allowed him to take 1974 as a sabbatical year away from his position as head of the university's Department of Soil and Water Science.

He began the year by following up on some experiments which had not been entirely successful some years before, when he was in charge of agricultural research in a Negev settlement. There they had tried to coat the slopes of the desert with a waterproofing compound, so that there could be maximum use of whatever rain did fall by increasing its run-off onto more arable land below. They found, however, that in many cases cracks formed in the surface of the soil, and the rain simply penetrated the ground more effectively through these cracks.

So he decided to apply the lesson of this failure to another region, where infiltration rather than run-off was what was wanted. In Israel only one-quarter of the land can at present be cultivated, and half of that area is under irrigation. In the other, rain-fed half, more than 50 percent of the rainwater goes to waste in run-off, evaporation or weed growth.

By rainproofing clods of earth, he reasoned, he might greatly reduce this wastage. For, instead of the normal process in which the rainfall breaks down the clods (just as in the glass of water) and produces a muddy crust on the surface, the protective coat would hold the clods together during rainfall and far more water would seep steadily down to nourish the roots of crops. Weeds, which germinate near the surface, would get much less water and their reduced growth would cut the need for herbicides and field labor.

With some of his students he tried using a modified potato-digger to lift the clods and spray them thoroughly before dropping them back. The trials were encouraging. So he turned to computers, working first at Wageningen University in the Netherlands and then at Texas A and M University, to do (in the words of the title of the paper he and two other professors in Texas have published) a "dynamic simulation of water storage in fallow soil as affected by mulch of hydrophobic aggregates."

They designed a mechanistic numerical model, and put it through a four-day simulation run in which they simulated two rainstorms lasting six hours each, as well as four evaporation cycles. They tested it for different soil conditions and for varying thicknesses of mulch, ranging up to 10 cm thick.

Again, the results were encouraging. To take the extreme cases in the simulation run: the crusted and unmulched soil lost 4 cm of the 14.4 cm of precipitation to run-off and another 4.8 cm to evaporation; the soil covered with the 10 cm mulch lost only 0.3 cm to run-off and evaporation. It gained two-and-a-half times as much moisture in



Photo: Clyde Sanger

water storage down to a depth of about 70 cm as did the untreated soil.

Obviously many questions remain. What is the optimum size of the clods? Big enough to act like a layer of gravel and let the water penetrate; but not so large that there are large cavities between them which would allow vapor transmission and evaporation. How deep a layer of soil needs to be treated? Professor Hillel thinks about four inches is enough.

What is the best material? How long will it last? And what would it cost? He used silicones, and found that by this means a clod mulch can be developed that will last a full season. At a retail cost of \$5 a gallon and using up to 15 gallons an acre, it would cost a farmer up to \$75 a year to rainproof an acre of land.

Too expensive for a small farmer? Professor Hillel thinks the outlay could make the difference between success and failure of a crop in semi-arid regions, and a small farmer could use the technique with hand tools. In 1975 he is planning bigger field tests in Texas and Israel, doing a cost-benefit analysis and writing two monographs on the subject. We'll clearly be hearing more from Daniel Hillel.

CLYDE SANGER

Reviews

WHILST TIME IS BURNING, by J. Roby Kidd. Published by the IDRC, Ottawa, Nov. 1974, 120 pages (IDRC-053e). Reviewed by M. K. Bacchus, Professor of Sociology of Education at the University of Alberta.

Whilst Time is Burning



This is a useful review of the problems of and developments in education in the less-developed countries. The two central concepts of "crisis" and "innovation" are used to summarize the major themes with which the author deals.

Crisis This term refers to the urgent problems facing education in the LDCs. In his overall assessment of these problems the author points to the "inability of the educational systems of most developing countries to cope with (their) present difficulties." As an example he cites "the persistence of institutional forms, school systems, structures, teaching methods and curricula designed largely from European practice of an earlier era and to a great extent irrelevant to present day needs."

Innovations In chapters 3 to 6 the author looks at some of the innovative attempts at overcoming the educational "crisis" in the LDCs and brings the reader fairly up-to-date on what has been taking place in this field. The author deals specifically with two current notions in education: the first is that of relating service and education, and the second is the idea of basic entitlement of all to some kind of education. He then reviews various attempts to integrate service and

education in different countries and in conclusion recommends that major attention "should be given to kinds and forms of youth service programs" and that "international funds for research development should be made available for this purpose." On the second theme Kidd notes that because of cost factors some people are now turning away from the goals of universal education, but argues that "educational entitlement by right for all human beings can be achieved in this century." He also discusses the necessary attributes of any program which aims at coping with this problem and outlines three related programs through which the idea of universal entitlement to education can be translated into reality.

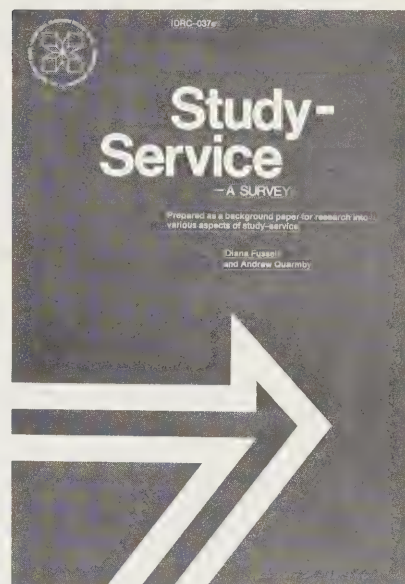
In attempts at grappling with the educational "crisis" of the LDCs Kidd argues that non-formal education has not been given enough attention by educational planners and sees the "need for education to be conceived as a total system embracing institutional and non-institutional forms," so that there will be a much greater consistency and coherence in educational planning.

But while the author focusses attention on the issue of "education for development" he really deals very little with the topic of "development" of the role of education in the development of these countries. It is virtually impossible to discuss the role of education in development as an overall goal unless one first specifies the aspect or aspects of development with which one is dealing. Secondly, the author misses the main root of the problem of education in most LDCs, which lies in the almost dualistic nature of their social and economic systems. Most educationists start with the assumption that if a more "relevant" education is offered people will prefer it. But what they fail to grasp is the fact that so far as the consumer is concerned the "relevance" of the education has little to do with its content: the most "relevant" education is seen as the type that will help in obtaining one of the economically and socially more rewarding jobs in society.

The LDCs are characterized by a dualistic economic structure—a modern or high wage-level sector and a traditional or low wage-level sector. Unless the differential rewards between these two sectors are progressively reduced the educational "crisis" is always likely to remain, and youngsters will always opt

for the type of formal education, however "irrelevant" its content might be, which will provide access to the high wage-level sector.

This does not mean that it is impossible to do anything about educational reform in the LDCs within the existing context, but any total reform of the educational system cannot take place unless there is a prior reform of the dualistic nature of the economic reward system of the society.



STUDY-SERVICE, by Diana Fussell and Andrew Quarmby. Published by the IDRC, Ottawa, Nov. 1974, 42 pages (IDRC-037e). Reviewed by Helmut Weyers, director of domestic volunteer services with the International Secretariat for Volunteer Service in Geneva.

In their booklet, Fussell and Quarmby are concerned primarily with student social service as a part of formal education. The booklet is, in fact, a result of their field work in Indonesia and their studies of, and cooperation with student and graduate services in English speaking countries. Their starting point is the fact that today "Study-Service Schemes" in one form or another are used as a means, in a growing number of countries, to give students a practical educational experience, to let them assist their countrymen by sharing knowledge, and to influence the system of formal education toward continually adapting it to the needs of the society.

They describe a number of study-service schemes, concentrating on their organizational/technical side, offer an interesting and helpful categorization of existing schemes, and analyze some of their basic elements. The booklet strongly emphasizes the idea that the elements of study and service, of learning and understanding on one side and of serving by establishing communication and sharing knowledge on the other, are the pillars of any type of voluntary or obligatory service for socio-economic development.

Continued

REVIEWS

*Continued from
previous page*

In the last chapter the authors introduce a research project to be undertaken, in the form of "action research". The intention of this project is to involve from the beginning the organizers of study-service schemes, and to establish a dialogue and a permanent exchange of experiences among the different schemes, thus assuring "direct and immediate" benefits for the organizations being looked into. Research here becomes one form of mutual technical assistance.

The paper reflects a solid position, selective in describing organizations and in favouring practical approaches. It invites discussion. It appears, through its careful phrasing, a bit too technical, though it could have included the dimension of national and international development policy, even with the material it uses. For instance, they could have linked study-service explicitly with undisputably necessary educational reforms: as far back as 1966 the Report of the Education Committee of India underlined the importance of the right *quality* of education for national development. This report included among its practical proposals for better quality, the introduction of "work experience as an integral element of general education". There is evidence that educational reforms could be influenced strongly or even preceded by well-organized study-service.

Another problem which should at least have been mentioned is the following: universities have often become elitist ghettos in developing countries. A service based on such "ghetto institutions" could easily over-rate the study and education aspect and under-rate the importance of the local, in most cases rural, community, its needs and its potential as the basis for national balanced development. If development and change have to come from inside society and if the universities are rather extensions of westernized efforts of civilization, then a focal problem of study-service is whether it is able to re-integrate students into their own civilization, making the development service element the most important, or whether it just assists in producing a better adapted westernized ruling class.

Fussell and Quarmby have shown in their practical work that they are aware of these problems, and they should have been reflected in their paper, the merit of which remains, however, to draw attention to a new development service movement, to pose important questions to it, to expose problems, to dwell on aspects of its potential, and to set a framework for discussion and research.

Commentary

A time for Intelligent policies

by M. S. Rao

The rapid deterioration in the world food situation since the latter half of 1972 has been of serious concern for the world as a whole and to food-deficient developing countries in particular. This has given rise to wideranging discussions, pessimistic predictions and speculations regarding the race between population and food supply. Thus, we have prominent people proclaiming that the world's food supply may never again be as abundant or its price as "cheap" as it was in the 20 years preceding 1972. We have environmental groups asserting that we have reached or nearly reached the limit of the world's ability to feed even our present numbers adequately, and predicting that the chances of increasing the world's food supply per capita to be poor. We have groups of meteorologists claiming that the climatic conditions in North America and the rest of the world were extremely favorable for crop production during the three decades preceding 1972 and warning that these conditions would change for the worse during the next 30 years, as we move toward the trough of the climatic cycle. Some of these also claim that they can perceive signs that the ice cover over the Northern Hemisphere is extending southward and some others opine that the deserts are on the march—swallowing large areas of agricultural land. These views have received wide currency and undue degree of acceptance, because the atmosphere was already charged with related concerns and predictions about the environment and the limits to the supply of non-renewable resources.

At the other extreme, we have the more pragmatic view, that, *at least* for the next decade or two the chances of world food production keeping ahead of population (even slightly) are very good. However, this does not preclude the possibility that there may be times and places where critical shortages may occur as has been the experience in the past. The former view the current

situation as foreboding a permanent change in the world food supply-demand balance while the latter consider it as primarily a temporary aberration that can be corrected by intelligent policies. The latter view seems to command more credence in light of recent history—the world food crises of the late forties and mid sixties have been followed by substantial increases in food production per person and a more abundant supply of food at cheaper prices. According to this view, the current high prices and limited supplies of food and fertilizer are likely to continue for the next year or two. However, in the longer-term, prices of food relative to prices of other goods and services can be expected to decline from current high levels, but may remain somewhat higher than in the sixties.

Several factors, circumstances and long-term trends have coincided to bring about the current crisis. In the late sixties and early seventies, the food exporting developed countries have restricted their food production to reduce their surplus stocks. By the late sixties, the fertilizer industry had emerged with excess capacity. The green revolution has taken hold in a few countries of South Asia and brought about a quantum jump in their foodgrains production. Thus, the world was enjoying abundant food and fertilizer supplies at cheap prices.

Then in 1972, world production of grains declined for the first time in over two decades, due to shortfalls in grain production in Canada, the Soviet Union, Australia, China and Africa. As a result, the USSR which was a net exporter of grain during the preceding two years purchased large quantities of grain (30 million tons.) during 1972 and 1973. The developing countries increased their import demand for grains in 1973-74. These purchases quickly depleted the reduced stocks of major exporting countries, especially U.S.A. Even though grain production reached a record high in 1973, grain prices

remained high and carry-over stocks low. Contrary to expectations, 1974 proved to be a poor crop year, especially for grain production. The pressure on food supplies has been heavy since 1972, not only because of the decline in production in that year, but also because of growth in grain consumption. The resultant upsurge in food imports and the drawdown in stocks, coupled with rapid inflation, growth in demand and currency adjustments, produced a dramatic rise in the prices of virtually all agricultural commodities. The most severe impact was on the major foodgrains—wheat and rice. Wheat prices have more than tripled from \$60 per ton in the second quarter of 1972 to \$210 per ton in the first quarter of 1974, while rice prices have quadrupled (from \$132 to \$570 per ton) during the same period.

The relative impact of the food price increase differed widely not only among producers and different strata of consumers within countries but also among countries. In food-exporting developed countries, higher prices were reflected in higher farm incomes, and increases in the cost of the consumer food basket. However, the impact on the consumers pocket-book has been relatively modest as food accounted for between 20 and 30 percent of the consumer budget. On the other hand, in the developing countries where food prices were not controlled, the impact of high food prices was most severe, especially for the poorest segments of the population as expenditure on food accounts for between 50 to 80 percent of total consumer expenditure.

By 1972, when the anxiety over food supplies led to an expansion of crop area in North America and increased needs for fertilizer in developed and developing countries, fertilizer demand began to overtake supply. The rise in grain prices in late 1972 gave further impetus to fertilizer demand and prices of fertilizer began to increase by leaps and bounds. Thus, the price of bagged urea increased almost eight-fold from \$45 to \$350 per ton between 1971 and 1974. The increase in petroleum prices was reflected in higher prices of other agricultural inputs such as gasoline, diesel and other petroleum products used in the developed as well as developing countries. Thus, while high prices for food, fertilizer and petroleum impose a heavy burden on the developed countries, this burden has been staggering on most developing countries that import large quantities of these commodities.

The food situation has worsened in 1974-75. The supply-demand balance is even tighter than in the

preceding two years. Cereals production has declined by 50 million tons and per capita output of all foods is lower than 1973-74. Stocks of grain in major exporting countries are expected to decline further to less than 100 million tons. On the other hand, the slow-down or stagnation in the economies of major industrial countries should reduce some of the demand pressure on food. However, pressure of demand on exportable supplies of cereals has increased. Export controls of some sort or other are in existence in all major grain exporting countries. Thus, the present world food situation is serious and production efforts during 1975-76 may be handicapped by fertilizer shortages.



Dr. Rao, an advisor with IDRC's Social Sciences and Human Resources division, served as a consultant to the Secretariat of the World Food Conference in Rome last year.

In the longer-term, the gap between grain production and demand for grain—the “food gap”—of the developing countries is expected to increase from about 15 to 20 million tons in the early seventies to between 45 and 85 million tons by 1985, if past production and consumption trends continue. Effective action programs are needed to narrow or eliminate this gap. There do not seem to be any immutable forces or circumstances that are not amenable to change through intelligent policies. The supply of inputs does not appear to be a limiting factor on future increases in food production. At least twice as much land is potentially suitable for crop production as is presently being used and the costs of bringing new land into production are not prohibitive. Also, there is a large gap between agricultural potential and agricultural practice in the developing countries. Even with existing technology, productivity could be increased three- or four-fold. In order to exploit this yield potential effectively, significant increases and improvements in the supply of inputs are needed. These

include irrigation, fertilizer, improved seeds, credit and extension.

There is also the gap between food harvested and food eaten. Losses in storage, processing, transportation and distribution are significant and these can be reduced if appropriate measures are instituted. Agricultural research effort to adapt new varieties and evolve appropriate production and post-harvest technologies have to be strengthened significantly both at the regional and country levels.

A revamping of development priorities to accord a larger share of resources to increasing food production in the developing countries is necessary. The major initiative for such action rests with these countries. At the same time, bilateral and multilateral donors have to provide more food, fertilizer and financial aid as well as technical assistance to alleviate present hunger and to increase food production in the developing countries.

It has been argued that the affluent should reduce their consumption of livestock products in order to release some grain for the hungry. This does not seem to be either an effective or efficient means of providing grain. The main stumbling block to transferring food from developed exporting countries to needy developing countries was not the availability of grain, but the sharing of the burden among donors. Thus, the meeting of grain exporters and importers in Rome on November 29, 1974 was successful in securing promises regarding the availability of grain for food aid, but was unable to procure the financial aid to purchase and transfer the grain to the hungry.

The current food crisis has touched the imagination and the pocketbook of the common man in the developed world while it also touched the stomach of the poor in the developing countries. The short-term outlook is for tight supplies to continue, but the situation is amenable to improvement through concerted policy action. In the longer-term, there do not seem to be any immutable forces or circumstances that stand in the way of increasing food production to feed the growing populations adequately. The main barriers to achieving these objectives seem to be political in nature. The World Food Conference has tried to grapple with the issues and recommended the establishment of a World Food Council to mobilize the political support for implementing its resolutions. The Council was established last December and its success in tackling the problem depends on the political and financial support that would be forthcoming. There is reason to hope that these would be significant.

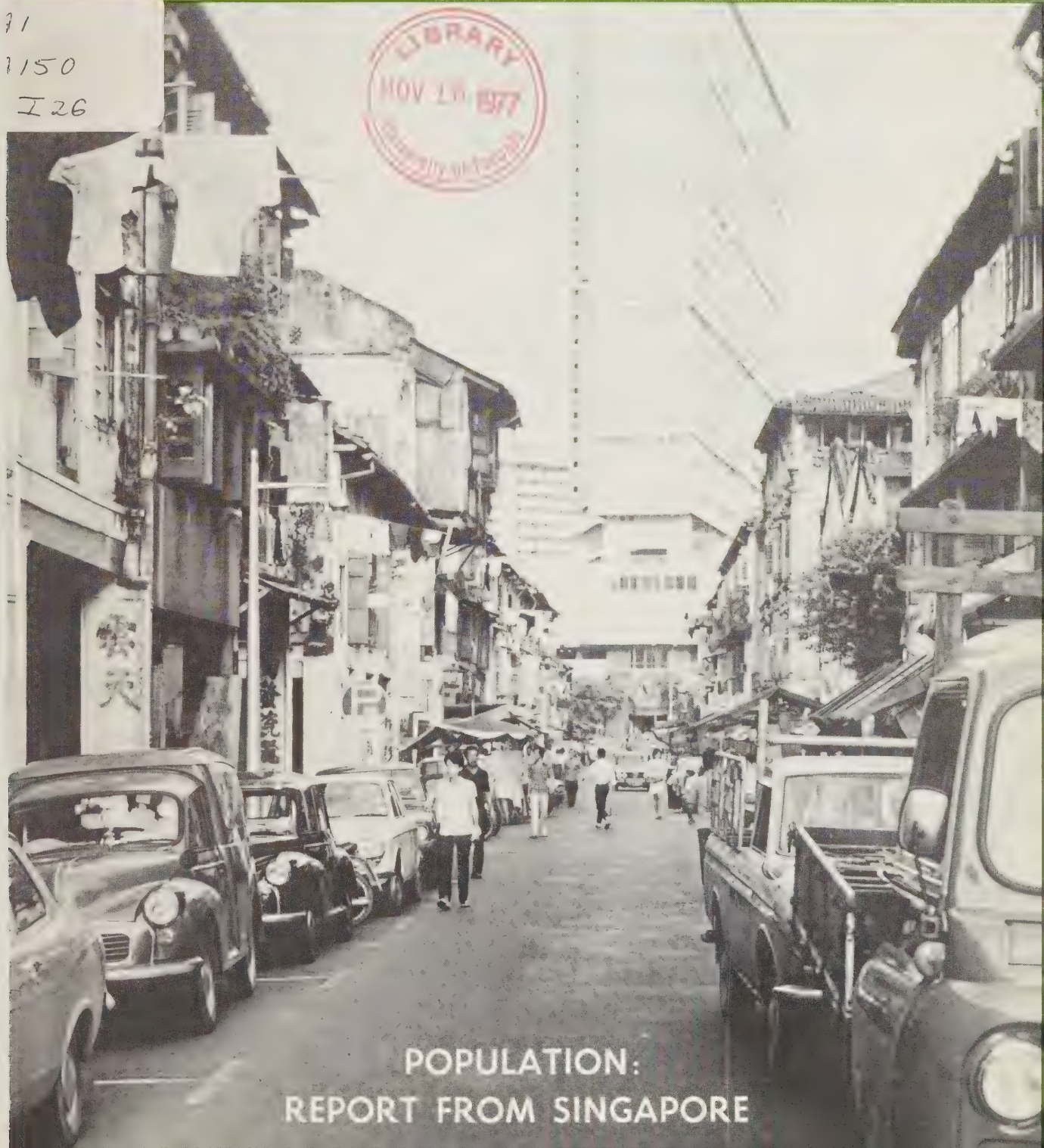
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Reports

VOLUME 4 NUMBER 2

71
7150
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POPULATION:
REPORT FROM SINGAPORE

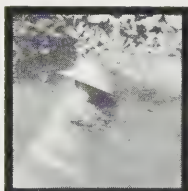
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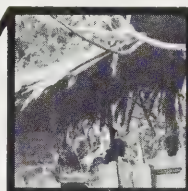
VOLUME 4 NUMBER 2

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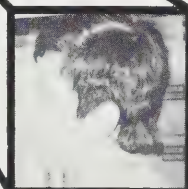
Aquaculture ... 10



Food 12



Women 18



Doctors 16

CONTENTS

Population — the Singapore experience

Article by Clyde Sanger 3

Tell me about your bananas . . .

Human resources, by Pierre-Y. Paradis 7

Regional News

Reports from Beirut, Bogota, Dakar, Singapore 8

Aquaculture

Photo feature 10

Food supplies in the Caribbean

Article by David Spurgeon 12

News Briefs

People, projects, events 14

Bringing doctors to the people

Rural interns in the Philippines .. 16

Review

Doctors and Healers 17

Commentary

Women in development, by Farida Shaikh 18

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POPULATION

the Singapore experience

**Clyde Sanger finds a lesson
for the rest of the world in
Asia's second most crowded city**

There are stereotypes for people writing about the population issue in Asia, just as there are about most other subjects. The rule of thumb seems to be: if you want to write a gloomy story, pick India or Bangladesh; if you want to express hopefulness, write about Singapore. The best of publications obey this rule. The *Asia 1975 Yearbook*, published by the Far Eastern Economic Review, comments: "The rest of Asia could learn from China and Singapore, both nations having tough population policies." A feature article in *The Asia Magazine* (December 29, 1974) carries the cheerful headline: "Tiny Singapore Tackles Big Issue with Audacity and Verve".

Both statements about Singapore are obviously correct, as far as they

go. But there are government officials, doctors and professors who don't complacently leave the matter there. What exactly can the rest of Asia learn from Singapore? That the tough policies, including the five "social disincentives", are working well? Or that a broader and more human approach is needed if people of all income groups are to be motivated into family planning?

Three current studies being supported by IDRC all touch on this question of motivation. Each is approaching the question from a slightly different angle. Dr Aline Wong, Professor of Sociology at the University of Singapore, is interviewing Chinese working-class women and their husbands to find out how much of a deterrent each of the five disincentives

is proving to be. Mrs Pavala Gopinathan, a social worker by background, is working with Tamil-speaking families who have recently been moved into the high-rise New Estate; her object is to estimate how intensively such families need to be visited and helped before they become responsive to family planning. And Professor S. S. Ratnam, head of the Department of Obstetrics and Gynaecology at the Kandang Kerbau Hospital for Women, is coordinating a study of the attitudes of women who come to the hospital for abortions, with follow-up interviews at intervals after the operation.

Before going into more detail about these three studies, it is necessary to sketch in the background of Singapore's population picture.



Posters play a major role in the Family Planning and Population Board's publicity campaign.

When Singapore's modern history began with the establishment of Raffles's trading site in 1819, the settlement consisted only of 120 Malays and 30 Chinese. As the harbor developed and business thrived, the population grew rapidly, mainly through the influx of migrants from China and India. In 1901 it stood at 230,000 and by 1911 it had reached 311,000. During the 1930s the British authorities enacted the Alien Ordinance which limited male immigrants to a monthly quota. But in a five-year period (1935-39) no fewer than 190,000 Chinese women immigrants arrived; their coming restored a balance between the

sexes, and led to the postwar baby boom. In the decade 1947-1957, the annual population increase rose to 4.3 percent, and the problems of overpopulation began to be faced.

This involved organization, plans, services. A voluntary organization, the Singapore Family Planning Association, did important work for 17 years in health education programs. But by 1965 it was clear that a comprehensive national scheme was needed, and the government took over responsibility for all the activities.

The Singapore Family Planning and Population Board was inaugurated in 1966, with a five-year program to

provide services to 180,000 women – or 60 percent of all married women between 15 and 44 years old. The Board has come close to its target: the number of acceptors recorded up to the end of 1973 was 211,073 women. The Abortion Act and the Voluntary Sterilization Act were both passed in 1969, and under their provisions a total of 14,102 abortions, 23,445 female sterilizations and 874 vasectomies were performed up to December 1973.

At the same time, five types of disincentives to having large families were added. Delivery charges at government hospitals were graded so that each additional child cost more than the last. A fourth or subsequent child lost any guarantee that he could enrol in the primary school preferred by the family. No income tax relief and no maternity leave was granted for later children. Finally, large families lost the priority they had enjoyed until 1967 in the allocation of Housing and Development Board apartments (this penalty was subsequently discontinued in February this year). As a positive incentive to sterilization, three of these penalties are waived if the mother is sterilized after the delivery of this extra child.

The rate of population increase came tumbling down – at least until 1971. From a peak of 4.3 percent in 1957, it dipped to 3.6 percent in 1962, went more sharply down to 2.5 percent in 1966 and – under the government's new pressure – dropped to 1.7 percent in 1971. But at that point it levelled off, and even rose a little. However, in 1974 the growth rate was down again to 1.6 percent. Now Singapore has 2.2 million people living in 225 square miles, second only to Hong Kong in population density.

This short upward curve is partly due to the fact that the large number of women who were born during the postwar baby boom are now in their years of childbearing. But a survey carried out by the Board late in 1973 among 2078 married women between 15 and 44 showed that the desired family size was, on average, more than three children; and two-thirds of the women said that, if they already had three daughters, they would want to have a fourth child in hopes of having a son.

To counter this attitude, the Board began a fresh publicity campaign for a two-child family, featuring only girls (well spaced in age) on the poster. "Girl or boy, two is enough".

And the old jingle was resuscitated:

*"A son is a son
Till he gets a wife;
A daughter is a daughter
All her life."*

The phrase "hard core" has crept into hospital reports and official documents to describe women who seem to have closed their minds to the need for family planning. But, as the FPPB's report on the 1973 survey points out, the fact that nearly one in three of the respondents in the 15-24 age-group had never used any form of contraception (compared with less than one in five in the 25-34 age-group) is not sufficient reason to call them "hard core"; they may simply want to start a family early.

Mrs Gopinathan also has strong reservations about the phrase, and prefers to call the non-acceptors "hard to reach". With the help of an award under SEAPRAP (Southeast Asia Population Research Awards Program), she is setting out to get to know on a personal basis some 90 Tamil-speaking families who already have three children and no definite intention to practice family planning.

She plans to test her belief that such people have a variety of reasons for not visiting a clinic: perhaps a woman organizes her day badly, spending hours doing housework; or she hesitates to go to the clinic because she doesn't speak English (although her teenage daughter does, and could have accompanied her). Other women, she recalls, have said: "I don't get any privacy for sex for months on end; so what's the point of



Mrs Pavala Gopinathan: reaching the "hard to reach".

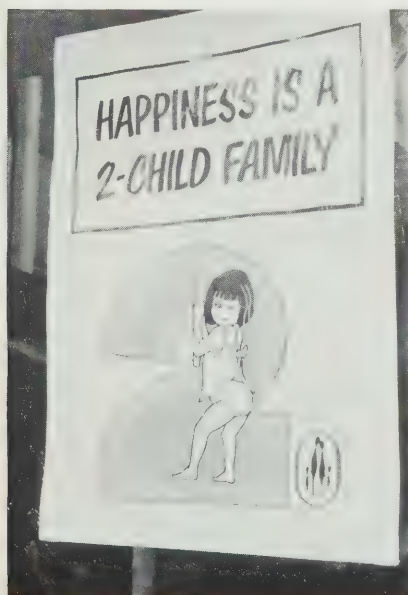
taking the pill every day?" With all the vigor of someone who has been a probation officer and a social worker, she plans to help the 90 families organize their time better. Some of the families she is visiting more frequently than others, in order to gauge how much it may cost (in a social worker's time and salary) to produce a worthwhile response.

Aline Wong's study of the deterrent effects of the disincentives is also based on getting to know whole families on a personal basis over a period of months. She has two housewives working with her as interviewers, because she is convinced they can relate better to Chinese working-class women

than her university students can. There are no set interviews, but in each of five visits they steer the conversation round to particular topics (Conversation One: the structure of the family and arrangements for child care). Dr Wong has become interested both in the role of the mother-in-law and in the use which mothers with jobs make of fosterparents, possibly a neighbor who charges S \$100 a month. She suggests all these relationships have an important bearing on a couple's decisions about how many children to have.

Eventually she will have interviewed about 100 families, who have two or more children. Her findings so far indicate that the disincentives are not by themselves a full deterrent to large families. Rather than worrying about losing priority on the housing list, for instance, parents may have decided to "stop at two" because HDB flats are uncomfortably crowded with more children. Certainly it is revealing that, in the 1973 survey, women nearly twice as often said they thought the disincentives would affect other people's decision about family size as said it about their own situation. (It is a case where, the more people say it, the less true it can be!). In that survey, the accouchement fee was shown to be the most effective deterrent, particularly among the poorer Malay section.

The third study, supervised by Professor Ratnam, is designed to assess the effect which an abortion has on the mental health of the mother and also to provide information that will



*"A daughter is a daughter
all of her life . . ."*



Dr Aline Wong (right): getting to know families on a personal basis.



Professor Ratnam (left) in his laboratory: motivators should take a broader and more human approach.

be helpful in motivating people towards pre-conceptive contraception. His team is interviewing 1200 married women who have applied for abortions (which cost S \$5 in public hospitals), dividing them into 12 "cells" by age-group and number of living children, and also matching them with an equal number of pregnant women who are proceeding to delivery. The 34-page questionnaire, administered to them before the abortion, explores many subjects: attitudes to children, contraceptive knowledge and practice, medical history, the effect of the disincentives. A follow-up questionnaire, some six weeks later, focuses on the quality of abortion or delivery services, and upon attitudes towards children at that stage.

Professor Ratnam says that Singaporean officials do a good job of making sure nobody leaves hospital after an abortion without being contacted by a health worker whose job is to explain about family planning services and the 51 clinics that offer them. But he also thinks the findings of the study will add weight to the argument that motivators in Singapore should take a broader and more human approach, and should help solve some of the domestic problems which preoccupy many women to the neglect of family planning.

This is a sobering lesson for other governments to learn, who may think that a rise in general standards of living, combined with heavy official support and enterprising publicity for family planning campaigns, will bring a steady reduction in the rate of population growth. The Singapore experience suggests that this is true only up

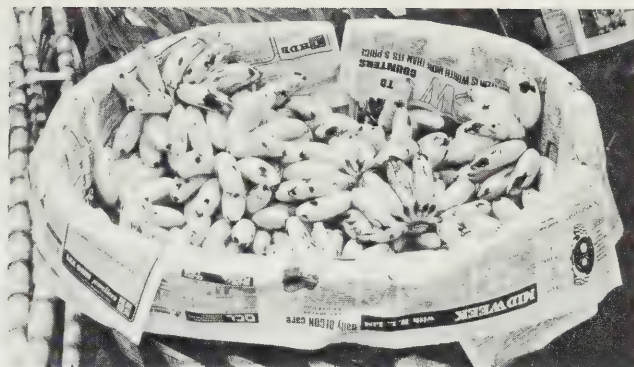
to a certain point. After that point, it becomes a matter, not of compiling statistics nor of printing posters, but of dealing with all the complexities of humanity.

Clyde Sanger, director of IDRC's Office of Public Information, was in Singapore earlier this year.



New housing estate in Singapore: 2.2 million people living in 225 square miles.

Tell me about your bananas . . .



The IDRC has always been concerned with people as well as with projects, and during its first year began a program of bursaries with the aim of developing the human resources involved in international development.

In this way the Centre hopes to enable both Canadians and nationals of Third World countries to engage in personal work that is particularly related to the problems facing the less-developed countries. The Centre aims to assist these countries to develop in their own way, according to their own capabilities and objectives. Against this background, it would perhaps be interesting to take a little closer look at the work of one recipient of an IDRC bursary.

Paul Perrault is a young Canadian from Quebec writing for his doctorate in economics at Stanford University. He was chosen as a bursar in April 1972, and began his work in the field at the beginning of 1973. His thesis in micro-economics included a case study of the banana trade in the Congo Basin. In addition to making a survey of the existing literature on the subject, Paul used the official statistics and collected information on the trade in the markets of Kisangani, Zaire. This work took a full year, during which Paul made contact with the reality of Zaire.

We present for you here some reflections on the work of this bursar. In our offices in Ottawa, where the progress reports reach us regularly, it is difficult not to comment on these works.

So, what to think of economics, Paul's discipline. In the western world this science had developed to the point where it occupies the dominant role among political instruments. Therefore, it is always with a certain apprehension that one views the appearance of a project of this nature for the third world. Now from the start Paul knew that his research must be centred on a problem of the less-developed countries and that this would necessitate a real contact with the daily lives of the people involved in the banana trade—from the small producers to the small retailers who sell in the markets of Kisangani. His study would be more than just data for a bureau of statistics; it ought to include a grassroots survey with the assistance of a small team of interviewers whom he should meet regularly. His thesis would include a concrete dimension uncommon in studies of this type.

What is an economist still full of the brilliant theories of his professors going to meet along the way? And what will he gain from the enormous time spent in gathering these data? Let's forget the administrative worries, difficult to accept but so easy to explain at a distance. Emphasize instead that a shortage of gas on Sundays as a result of the fuel crisis is perhaps embarrassing on an autoroute in the USA, but to wait several days in Butare, Rwanda, before being able to venture onto the African dirt road to

Kisangani is a somewhat different matter, even without allowing for having the same difficulty in refuelling along the route.

For Paul the banana trade will always be a reminder of these stops in the villages, where sick children serve as a means of exchange for information: "We will talk to you about our bananas if you bring medicine for our sick children." There will always be, too, the women—driving their trucks, gathering their cargo of bananas from local farmers, and selling them by the bunch to other women for their stalls in the market at Kisangani.

This long series of transactions involving only women doesn't relate too well to text book economic theory, that never takes into consideration the sex of the intermediaries in a commercial process. Yet here is one economist who will not be able to forget that he has seen a functioning economic system in which very few men appear. Thus Paul added to his economic survey a series of anthropological and sociological observations that illustrate the complexity of everyday life in the region, and we venture to think that he perceived the precariousness—the degree of abstraction—of economic data.

For this economist mere numbers will never again be more than a poor substitute for an actual experience which it is almost impossible to communicate. Numbers now seem to be only an abstract account, giving no hint of the difficulties overcome in obtaining them. For obtaining the information that these numbers represent was not easy. To the people of the villages it is very personal information. The banana trade is a part of their lives. Why, then, should some stranger come nosing around? A very natural modesty makes the people reticent about displaying their way of life. They try to hold onto their little bit of autonomy, to remain masters of their own business; to talk about it to a stranger, that is to share, to lose.

So to get the information sometimes requires almost drastic measures, and such hard won data can never be just numbers in some computer memory. Paul's data may serve for a long time, and be used by many researchers who will see only numbers, yet Paul will always be aware that it is necessary to add a human dimension to economic theory in order to get at the reality of their lives, and thus of the economy, of the people of the Kisangani region.

Whatever the outcome for Paul in maintaining his thesis at Stanford, we believe we can say that we have enabled him to add to his personal development a contact with the concrete reality of the Third World and the awareness that statistics are, at best, only a partial image.

REGIONAL NEWS

Dakar

Since its establishment in 1973, the African Regional Office has seen its role as representing to the IDRC in Ottawa the special needs and requirements of Africa to which the Centre might reasonably be expected to be able to respond.

Compared with the other regions in which IDRC is active, Africa appears to be less well endowed with trained researchers and research institutions. It is, however, clear that research is now being seen as a basis for many development activities, and by this is meant research undertaken within the region, which necessarily addresses itself to problems as identified by the nationals of the countries concerned. Thus one sees that more and more countries are trying to provide a national research structure—with the creation of national research councils and so on. In Senegal for instance, for the last year-and-a-half, research has been the responsibility of a separate “Délégation à la Recherche scientifique et technique”, responsible directly to the Prime Minister.

Their awareness of the importance of research in problems facing developing countries means that the IDRC support should be much in demand. Nevertheless there are problems: up to now IDRC has preferred to give assistance to existing institutions, and to avoid assistance usually termed “institution building”. Similarly, many countries in the region have little research capacity at present. The problem often raised in the Regional Office is whether, under these circumstances, we should accept that there are certain countries in the region in which we are unlikely to sponsor activities because they lack the basic research structure; or should IDRC be ready to make a special effort in order to assist those countries at present poorly equipped for research?

This question is not a new one in IDRC. It has already been considered by the Centre's President and Board of Governors, and is a question to which there can never be any definitive response but which must be continually borne in mind by those at all levels of the IDRC (in the regional offices and in the head office in Ottawa) in considering requests or suggestions for possible projects emanating from the countries in the region.

TIM DOTTRIDGE

Singapore

The staff of the Regional Office were actively involved in April in a Seminar, hosted by the Nutrition Center of the Philippines, convened to discuss the Integrated Approach to Local Rural Development.

The meeting was opened by the Secretary for Local Governments and Community Development of the Philippines, the Honourable José Ronó, who was himself a prominent worker in the rural development field prior to his becoming the Cabinet Minister. The closing address was given by Mrs Estefania Aldabe-Lim, Secretary for Social Welfare, who has also had considerable interest and experience in the problems of rural development.

In addition to government officials, academics and directors of integrated rural development projects, the seminar was also attended by the Minister of Health for Papua New Guinea, the Honourable Donatus Mola, whose interest in the seminar was to learn from the experiences of practitioners in this field and to help his government formulate policies for rural development, as the country approaches full independence in September 1975.

Although the majority of the seminar participants were from the Asian region, Dr Oscar Echeverri, Director of the CIMDER Rural Health Development Project in Cali, Colombia (which is supported by IDRC), also attended to

give participants the benefit of his experiences. An interesting paper on the pitfalls of the integrated project was presented by Dr Sook Bang from ESCAP, which set the tone for subsequent discussions.

Papers were also presented on the Saemaeul Movement in Korea; the Integrated Rural Development Programme in Bangladesh; the Thailand Rural Reconstruction Movement; the Buhi Rural Social Development Center Project in Camarines Sur, Philippines; the Multi-Pronged Approach to Rural Development of Xavier University in northern Mindanao, Philippines; the Community Development Service in Yogyakarta, Indonesia; the Perak Youth Scheme and the Muda Scheme in Malaysia.

The seminar also discussed government policies in rural development and the possibilities of regional cooperation in this field. The need for training and exchange of personnel, as well as the dissemination of information, was discussed and the offer made by the Nutrition Center of the Philippines to act as a clearing-house for such purposes was accepted by the group.

The seminar ended with a day-long visit to the Paknaan Community Medico-Social Services Project of the Cebu Institute of Medicine, which was under the direction of Dr Florentino Solon, Executive Director of the Nutrition Center, prior to his assuming this post. The group learned of the experience gained in training young doctors to work in barrios (villages) as part of their medical curriculum. Visits were also made to several centres for malnourished children in Cebu which are being replicated on a national scale by the Nutrition Center.

NIHAL KAPPAGODA

Reports from the Centre's regional offices in Africa, Asia, Latin America and the Middle East

Bogota

The IDRC attaches special importance to the philosophy of supporting research that is defined by the participating countries as being necessary to their development.

However, it is not easy to identify the priorities as seen by the countries themselves. Their development philosophies, aims and objectives are not always explicit; they probably exist, but scattered throughout various plans, documents, diagnoses, etc. There may also be political conflicts between the scientific community and the national planners and administrators concerning the manner in which these objectives should be achieved. However, if the Centre wishes to achieve its aim of strengthening a local research infrastructure that meets the needs of the countries, it is obligated to find and use the tools that will enable it to adequately meet these needs.

An awareness of the need for information concerning development plans and programs, both of a general and sectorial nature, in the countries within the region, led to the establishment within the Latin American Regional

Office (LARO) of an experimental Program Support Unit.

The Unit carried out an initial study in Colombia. General information concerning development plans for the health, agricultural, education, nutritional, technological and other sectors was gathered. On the basis of this information, the health sector was chosen for a detailed analysis. The last step in May was a meeting of all the planners, administrators and local researchers, to let them evaluate the validity of the study and to provide them with a classification of the research needs detected to date.

The first experiment in Colombia has been very useful, partly because this country has excellent human and institutional resources, and the planning process has been going on for some time. This had made it possible to improve on our initial concept and to learn from the efforts made by the Colombians.

By way of a second phase of the experiment, the Health Division of LARO has chosen Panama to implement the methodology in a country that differs from Colombia both in size and in human and institutional resources, and that probably is representative of several countries in the region. The study will be conducted in Panama through the Teaching and Research Division of the Department of Health. For the recently formed Division this effort to identify and classify its research priorities will be a very useful exercise.

PATRICIA MERMELSTEIN

Beirut

The most surprising thing to a newcomer in the region is its diversity. To a Westerner with only a newspaper knowledge of the Middle East, this comes as somewhat of a shock. This diversity has in fact been consistent through thousands of years of history and expresses itself today in the different forms of spoken Arabic, the different styles of dress, the rich variety of architectural forms, and political and social problems which are expressed in ideologies and governments of an often antithetical nature.

Much in the substance of a number of the region's governments seems totally contrary to what the average Westerner has been brought to believe. Who would expect for example that Iraq and Syria would adopt solutions to their many social and economic problems in a progressive and very planned manner, devoid of the kind of fanatical conservatism which many would seem to ascribe to them; that 30 percent of the medical students and 50 percent of the pharmacy students at the University of Damascus would be female; that a significantly high percentage of the most important scientific minds and researchers in both

Lebanon and Egypt are female, while in Saudi Arabia, women are not permitted to drive cars or publicly appear without a veil?

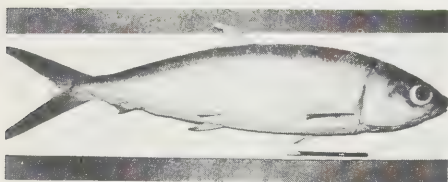
In fact this rich variety in the region, which we in the West have tended to identify as somehow constituting one "Arab" culture, is what makes it so volatile and subject to extreme reactions from the process of economic development and social change. Yet it is also this heterogeneity which affords such an interesting and challenging area for social and scientific research, a challenge which is rapidly being taken up by the growing number of scientists the region is beginning to produce. Whether these human resources will however be immediately mobilized by the massive oil revenues being accumulated by the Arab oil-rich states and Arab donor-funds, remains to be seen. The region has not in its recent history established a tradition of funding applied scientific research with public funds. This is especially the case with regard to social research of a non-commercial or non-economic nature.

Until that time when the region's financial resources will be more fully brought to bear on solving social and economic problems through scientific research in the region, the IDRC can effectively exercise its role as a catalyst and advocate of applied research for bringing about and coping with rapid economic and social change. For a Canadian, certainly the context could not be a more interesting and challenging one.

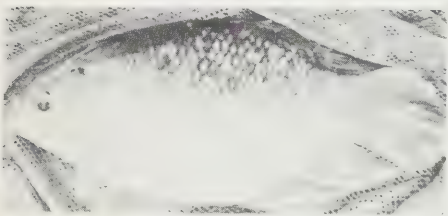
J. INGRAM



Fish farming can help meet food need



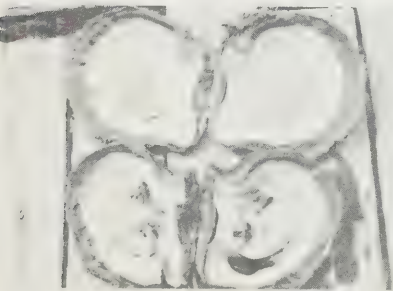
Milkfish – Philippines



Chinese carp



Indian carp



Oysterculture – Thailand

Not so long ago scientists believed that the resources of the sea were virtually limitless. But twentieth-century technology, with its floating factory ships, has changed all that. Now it is generally accepted that the amount of fish that can be taken out of the world's oceans is nearing its limit – and in some localities may already have exceeded it.

Yet in a hungry world – a world in which malnourishment is often as big a problem as undernourishment – fish is an important source of dietary protein, and has the added advantage of being a highly efficient convertor of waste matter into edible protein (compared, for example, with intensive cattle rearing, which requires 10 lbs of feed grain to produce 1 lb of beef).

Recognition of the limitations of the oceans' natural fish stocks has led to a growing worldwide interest in aquaculture – fish farming – as a complement to commercial fishing. The art is by no means a new one, it has been practiced in Asia, for example, for thousands of years. But at present only a small portion of the areas with high potential for aquaculture, such as lagoons, mangrove swamps, ponds and reservoirs, are being fully exploited for fish production. Experts predict that a coordinated international effort could lead to a ten-fold increase in production by the year 2000

– from the present five to 50 million metric tons of fish products annually.

Research is currently concentrated on four aspects of aquaculture. First, to increase the production of fish fry by means of induced breeding. Second, the development of adequate feed supplies, preferably through promoting intensive production of natural foods and providing supplementary feeds from waste products. Third, to cultivate new “domestic” strains of fish through genetic selection and hybridization. And fourth, the design of more efficient aquaculture systems, such as combination systems integrating the farming of fish with plants, poultry and livestock.

Aquaculture on an industrial scale will present a whole complex of management problems, ranging from control of pollutants, disease, predators and pests to the assessment of a proper balance of cost factors. To a considerable extent it is an unknown field, and there is a scarcity of trained personnel. So there is also a real need for training programs to fill the personnel gap.

Research, development and training are the keys to a significant expansion in aquaculture production. Such an expansion will not solve the world's food problems, but it will provide another vital link in the chain that can contribute to a future without famine.



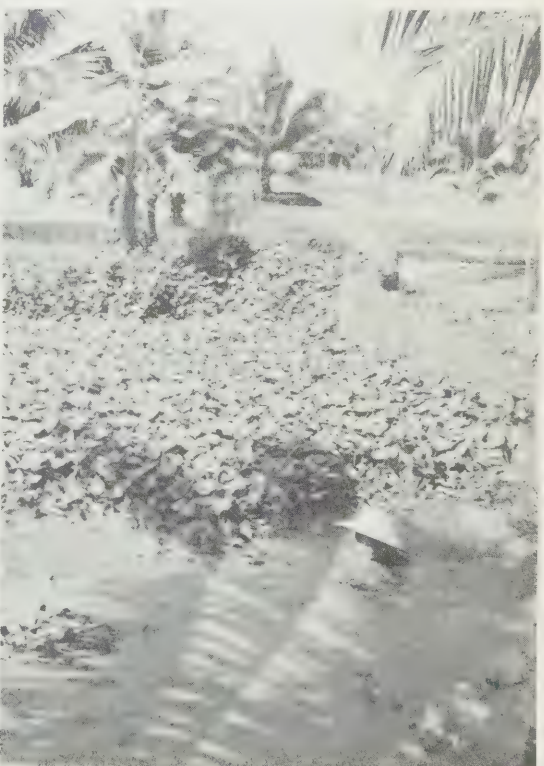
Left: Prize specimen from a polyculture pond system in Thailand, where several species are raised in the same pond. Centre: Fish fry collection in India. Above: Feeding "trash fish" – waste fish products – to catfish in Thailand.



Above: Grass carp in Malaysia receiving injection of gonadotropin, a hormonal extract from Canadian salmon that induces spawning in female carp. Below: Fish hatchery in Indonesia provides a controlled supply of fish fry.



Above: Part of a modern large-scale pond system in the Philippines. Below: Combination systems, such as this one in Thailand, can involve the integrated farming of fish with plants, poultry or livestock.



Inflation, bad weather and the resulting instability of world food markets in the past couple of years have left many countries wishing they could be self-sufficient in food supplies, or at least less dependent on imports. The Caribbean countries are no exception, and here there is evidence that something is being done about it.

A symbol of the growing desire for self-sufficiency in food and to export products other than the traditional sugar crop is the Instant Dehydrated Yam – the West Indian equivalent of instant mashed potatoes. Produced at a pilot plant in Barbados – where they are cooked, mashed and drum-dried after being rolled into a thin film, then broken and packed – the yams have been test-marketed in Europe, North America and the Caribbean with fair success.

The purpose is to make good use of abundant native root crops. Potatoes do not grow well in some West Indian islands, but there are plenty of yams, and much of the crop would go to waste if such uses were not found for it. In addition, such a product, if it were successful, would tend to replace imported products with indigenous ones.

Dehydrated yams are just one example of this general approach. During a recent visit to the University of the West Indies Trinidad campus I was told of the following as well:

– A corn-flakes-like breakfast food made from sweet potato flour enriched with soya protein.

– A composite flour for breadmaking made with 20 percent yams or 15 percent sweet potatoes.

– A cordial called Sorrel, made from the calix of the hibiscus, which could be used in plain or carbonated drinks. A Sorrel drink has been popular for years around Christmas time, but previously could only be made seasonally because of the blooming time of the plant's flower. The cordial has been obtained for year round use by means of flash dehydration.

Trinidad's reliance on food imports goes back a long way and is extremely heavy. In the days of slavery, even the slaves' food was brought in from their native countries. Today, most meat is imported, except recently pigs and poultry, as is all wheat for making flour. Fifty to 60 percent of the raw materials for dairy products processed on the island are imported, and 80-90 percent of the pork for making ham, bacon and sausages.

Anyone for instant yams?

by David Spurgeon



Sorrel flower: used in making Christmas cordial.

Most surprising is the situation regarding non-citrus fruits and vegetables. There are four fruit and vegetable canning plants in Trinidad and Tobago, which produce mainly tomato ketchup, mixed vegetables, jams, jellies, marmalades, fruit juices and nectars – yet 80 percent of the raw materials for making these products are imported. The 20 percent that are of local origin are largely bought on the open market, with little control of varietal types or quality. One explanation offered was that, because fruits are usually considered products for affluent markets, and because they grow practically wild, Trinidadians pay no attention to them as domestic food crops.

Dean C. K. Robinson of UWI's faculty of agriculture says the chief problem with agricultural production in Trinidad is that people don't want to work in agriculture because of the low wages and low prices for farm produce. The oil fields and industry are more attractive. Estate owners find it difficult to pay the wages being asked and the small farmer finds it difficult to survive. But one difficulty in increasing reliance on indigenous products has other roots: "We have acquired a taste for wheat flour and it is extremely difficult to get that changed."

So in addition to developing new food products, agriculturalists and food specialists are trying to promote the consumption of indigenous crops generally rather than imported ones. Thus attention is being given to increased production and processing of crops like pigeon pea, and the use of root crops as animal feed in place of more expensive imported feed grains.

But the program to increase food production goes beyond simply supplying the domestic market. Prof. E. A. Tai, head of UWI's crop science department, in a paper with P. H. Haynes, says: "Food production has been fighting a losing battle in some areas of the world as is exemplified by the current situation in India (it could happen here, too), and therefore the aim should best not be restricted to growing for local consumption only; export of produce surplus to our needs should be an important consideration so that full advantage may be taken of greater efficiency of production based on results of research. We can then be of help to others while helping ourselves."

Last year, Dr Eric Williams, Prime Minister of Trinidad and Tobago, reported a new aspect to the program: turning over 20,000 acres of sugar lands in 20-acre lots to farmers for food production. In addition, swamp lands in sugar areas were being released for rice production, some marginal sugar lands freed for food production, and some crown lands not in sugar let go for food production.

The basic problem of low agricultural production is being worked on by a number of investigators in a variety of projects. One, called the grain legume program, was begun in 1972. Its aim is to achieve year-round production of pigeon peas, and to make mechanical harvesting possible. The program is funded by the IDRC, Britain's Overseas Development Administration, the West Indian governments through the Regional Research Institute, and the UWI grants committee.

Pigeon peas grow easily in Trinidad; the plant does not respond to fertilizer and can be grown without pesticides. All the small farmer has to do is keep it free of weeds. The plants can be seen growing almost wild on most small landholdings (one-half to 10 acres) and the occupant of the land consumes the peas as a fresh vegetable, marketing any surplus locally or selling it to the canning fac-

tories. But the amounts grown locally cannot meet the demand, and as a result large quantities of dry peas are imported. More than 600 additional acres of peas would be required to meet the processing plants' demands, it has been estimated, and such production would generate \$300,000 annual income for farmers, \$500,000 value added in processing, and \$500,000 in export earnings.

There is only one pigeon pea crop a year: the land is seeded in June or July and harvested in December. Pigeon peas are one of the few sources of protein for the poor in Trinidad, and thus are an important crop. There is also a market for the canned product abroad and it is estimated that present exports could be doubled.

However, to increase the output of processed peas, mechanical harvesting would be necessary, because the cost of hand labour would be prohibitive. The UWI's mechanical engineering department has thus set about designing a mechanical harvester that could be locally made.

In order to use mechanical harvesting, however, the plant's shape has had to be changed genetically to produce a small, semi-herbaceous plant rather than a large or medium-sized shrub. As it grows normally, the plant is a woody-stemmed shrub four to five feet tall, with many branches along which peas are produced. The plant that has been developed for mechanical harvesting produces peas at the ends of the branches instead of along them. The idea is to condense the cropping period and to obtain successive crops.

Underproduction of the pigeon pea in Trinidad is due to its being grown almost exclusively on small plots, and involving a high labour cost to harvest. The processing plant is under-supplied because farmers can get a higher price for fresh peas.

Another difficulty with the pigeon pea crop is in marketing. Processing plants pay 13 cents a pound to the farmer, just above the government's guaranteed floor price of 12.5 cents. But the farmer can get up to 40 cents a pound for fresh peas in the market – when he can sell them that way, because the market is uncertain. The farmers thus try to sell the peas fresh on the market if at all possible – sometimes even if they have a contract for their crop with the processors.

From the processing plant's point of view, estimating the size of the crop is difficult: many small farmers grow the peas without its being known until they show up with peas for sale. What is needed is a more efficient system: larger-scale farms, more efficient manual harvesting, mechanical harvesting and better organized marketing or contracting arrangements. For home use, the pigeon pea can be harvested over a period of time, but this makes the operation costly because it is done repeatedly.

Paradoxically, one of the uses for the potentially larger pigeon pea crop would be to make dhal, which at present is imported from India in substantial quantities. The Indian dhal is made from chick peas, but it could be made entirely from pigeon peas, thus obviating the need for imports.

The number and variety of agricultural problems faced by Trinidad are of course multiplied when seen from the point of view of the whole Commonwealth Caribbean, but these countries have certain attributes in common. This has led a group in the UWI to look at the question of research priorities for the whole area by examining the one country's situation in depth. The country chosen as the subject of the model was Barbados.

Under the direction of Prof. D. T. Edwards of the University's economics department, the group is trying to establish the relative economic potential of alternative crops and animals within the framework of overall agricultural resource use. This information will then assist researchers in defining research priorities.

But the program will not stop there: it will also examine the response of the agricultural economy to price and other market factors, which will point to research priorities in farm management, markets and agricultural policy as well as in agricultural science or technology.

The new orientation in West Indian agricultural research gained momentum only during the past 10 years or so. The trend in the university away from the traditional curiosity-oriented approach of the individual faculty member to a more organized, problem-oriented one, now seems fully established. What the results will be for the economies of West Indian countries cannot be foreseen, but some are hopeful.

"We see signs," said Dr Tai, "of encouraging optimism."

Subsistence farming in Trinidad: what is needed is a more efficient system.



Pigeon peas grow easily in Trinidad.



BRIEFS

AGRIS – unlocking the storehouse

After five months of operation AGRIS – the FAO's International Information System for the Agricultural Sciences and Technology – is now making its progress visible to the world at large. Subject listings of the world's current documentation are issued monthly in two forms: a magnetic tape that may be searched by machine, and a printed bibliographical record called *Agrindex*. The records now reach about 6,000 a month, and although this figure is only about one-third of the total ultimately expected, there is an encouraging upward trend.

From the outset it was realized that few countries were in an immediate position to provide their national records on the magnetic tape that is a basic requirement for an on-going information system on a global scale. The IDRC, which has been assisting in a variety of ways with the development and implementation of AGRIS since its inception, assisted at this stage by funding a special unit that receives records from developing countries and converts them to the magtape form. The Centre has also been actively involved in setting up regional information centres for Latin America and the Caribbean and for Southeast Asia, which are now providing valuable input to the System. As well, information is received from the nine countries of the European Economic Community, directly from Czechoslovakia, Japan, Morocco, Spain, the USA, the USSR and from the FAO itself.

The gathering of agricultural information in this global way is naturally not the prime aim of AGRIS. Studies are proceeding on ways in which this storehouse of knowledge may best be unlocked and its contents utilized. In concert with this overall activity, the IDRC's Information Sciences Division is increasingly becoming involved in the development and

support of projects that may now or later be considered as components of the AGRIS structure. International information centres for cassava, cowpeas and irrigation have been established, and the need for others is being investigated.

Centre staff are also engaged in the preparation of vocabularies for accurate and consistent retrieval of agricultural information, in considering computer requirements to maximize the value of the AGRIS data-base for developing coun-

tries, and in training information personnel in AGRIS methods. Considerations such as these will go a long way toward ensuring that not only global, but national or regional needs are met.

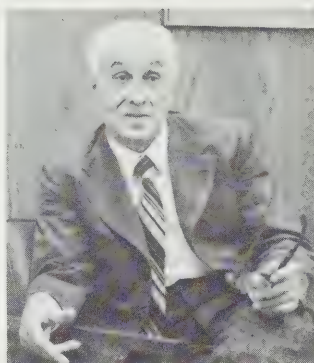
DON LEATHERDALE

In search of a safe and foolproof contraceptive

Dr Ibrahim Kamal is not satisfied – which is unusual for a man who has recently completed what is generally regarded as a successful project.

For two years, with the support of the IDRC, Dr Kamal carried out a series of tests on Egyptian women using the "Copper T" intra-uterine device. Invented in 1968 by Dr J. Zipper, the device is so called because of its shape and the fact that its stem is bound with fine copper wire. In parallel studies in his private practice and at the University of Cairo, where he is Professor of Obstetric Gynaecology, Dr Kamal has shown that the "T", because of its shape, becomes firmly anchored in the uterus, and the rejection rate is thus dramatically reduced. This immobility also reduces side effects such as pain and bleeding commonly associated with other devices.

But in common with other devices the "T" still shows a pregnancy rate of two to three percent, and it is these unwanted pregnancies that are causing Dr Kamal's dissatisfaction. Why, he wants to know, do IUDs sometimes fail to provide adequate protection? And that has led Dr Kamal to question one of the basic assumptions about the Copper T. What, he asks, is the effect of the copper in the Copper T?



There is no doubt, he says, that copper is lethal to spermatozoa. But is the contraceptive action of the Copper T due to the hostility of the copper ion itself? Dr Kamal thinks not. He explains that it has repeatedly been demonstrated that the greater the surface area of any device the better is its contraceptive effect.

Thus the effectiveness of the Copper T may be as much a

result of the increased surface area caused by the addition of the copper wire, rather than a simple chemical action as had been previously assumed. In support of his theory Dr Kamal quotes an experiment in which a plain plastic loop impregnated with copper showed no significant increase in efficiency. In future he hopes to be able to produce a "T" device bound with nylon thread rather than copper to prove his belief that the surface area of the device plays the major role in providing contraceptive effectiveness.

What will satisfy Dr Kamal? He wants a completely safe and foolproof IUD. A "Nylon T" device may not be the ultimate answer, but Dr Kamal is convinced that he is on the right track. And Dr Kamal is a man who has the courage of his convictions.

Corn plan aids Colombian farmers

You are a small farmer in Caqueza, Colombia. Your main crop is corn, it is food for your family and only the surplus – if any – goes to market. You'd like to try new methods to improve the yield from your land, but fertilizer, insecticide, new seed, all cost money. You have

no capital, and credit is expensive – maybe as high as 59 percent per annum for the \$100 or so you need. And if the new crop should fail you'll not only be in debt, you may not even be able to feed your family. So you stick to the old ways. You know your land

could, maybe, yield two or even three times as much corn, but you dare not risk it. This way at least you'll survive.

Last year the Colombian Agricultural Institute (ICA) attempted to break into this vicious circle by introducing a profit-sharing Corn Plan for low-income farmers in the Cauqueza region. Using the know-how of its local staff and the ICA-managed agrarian co-operative, and with a small "risk fund" provided by the IDRC, the Institute established a program involving 27 farmers.

Each farmer paid a \$10 entry fee, and received free advice, seed, fertilizer and insecticide. In return each agreed to apply the full "technology package" of the project, and to give the project half of any yield above 800 kilos per hectare. Since the average yield in the area was around 900 kg/ha, the risk was slight.

It turned out to be a bad year. The hot dry summer reduced the average yield for most farmers to 600 kg/ha. Yet the farmers in the Plan averaged 2,200 kg/ha, with some achieving as high as 3,600 and none less than 1,100. The income of even the worst of the 27 was four times the average for those using traditional methods. The cooperative, while it made little or no profit, did get its capital back.

In spite of all this the project staff consider the Plan only a partial success. There were some mistakes. Planting was delayed by a seed shortage and by administrative problems, and some farmers seeded their worst fields for the experiment. However, with the administrative problems now resolved, the elimination of poor fields, and, hopefully, better weather, 1975 promises an even bigger improvement. More farmers now want to join, and the Plan is being expanded to include other crops such as onions, tomatoes and wheat.

There will be more problems — the seed situation has worsened in the past year for example — but with the enthusiasm generated by the first year's results, and the experience gained by the ICA staff, it will not be long before farming in the region becomes more than just a means of survival.

Canada's candidate for FAO

Dr David Hopper, President of the IDRC since its inception in 1970, has been nominated by the Canadian Government as a candidate for the position of Director General of the United Nations' Food and Agricultural Organization (FAO) which becomes vacant at the end of this year.

In its official announcement of Dr Hopper's nomination, Canada's Department of External Affairs expressed the belief that "the FAO should be headed by a professional of high technical competence with experience in third world agricultural development problems.

"Dr Hopper's . . . outstanding technical and managerial talents make him uniquely suited to assure the increased and constructive contribution which the world expects from the FAO."

Dr Hopper has had extensive experience in the research and practice of agriculture and food development in third world countries. He has also been a leader in relating population



problems to social and economic development, especially rural development. He has had a close association with the FAO and the major world investment and agricultural research agencies. He was directly involved in the establishment of the network of international agricultural research centres, and was closely associated with the "green revolution" in Asia.

Governors meet in Singapore

The Governors of the IDRC held their bi-annual meeting in Singapore from 16-18 March at the Regional English Language Centre, where the Asian Regional Office is located.

Prior to the meeting the Regional Office staff briefed the Governors on the cultural and ethnic background and the main features of the economies of the ASEAN (Association of Southeast Asian Nations) countries — Singapore, Malaysia, Thailand, Indonesia and the Philippines. Another briefing covered the Industrial Extension Services Project (TECHNET) through which the Centre is seeking to assist eleven participating organizations in eight countries of Asia to develop their own extension services which will provide technological information and advice to small and medium-scale industries.

The governors also heard a report on an eight-country regional study on low-cost housing, which illustrated the network arrangements that have been developed by the Social Sciences Division in Asia. Visits were made to

the Housing and Development Board to learn of Singapore's experience in the public housing field (at present 44 percent of the total population lives in public housing) and to the Toa Payoh Housing Estate, one of the largest in Singapore.

The meeting was formally opened by the Minister of Finance for Singapore, Mr Hon Sui Sen. In his opening address the Minister suggested that the IDRC should concern itself with the problems of urbanization and social adjustments to an urban culture, as opposed to a rural emphasis.

Apart from the consideration of projects, the Governors discussed a policy statement by the President, in which Dr Hopper reviewed the performance of the Centre since it was set up in 1970, and presented suggested guidelines for its future operations. This statement, as well as the discussions arising from it, will help provide a basis for IDRC policies in the years ahead.

NIHAL KAPPAGODA
Asia Regional Director

Bringing doctors to the people

The Cebu Institute of Medicine in the Philippines provides a rural internship program called Community Medico-Social Services – its aim is to bring student doctors in closer touch with the people. The service was pioneered by Dr Florentino Solon, now executive director of the Nutrition Centre of the Philippines. In the village of Pakna-an, where it all began, he talked to participants in a seminar on integrated rural development about how the service started, the problems it has had to overcome, and the benefits it has produced.

We have seven medical schools in this country, and everybody would like to start a community medicine residency, but it is all on paper. I did not write on paper, I just started it, so this is now the difference, and I would have a hard time now writing it on paper, I tell you.

We want the students to reach the community because they have had always classroom and laboratory and hospital oriented education and because we have found out that many students would feel very insecure when they are out in the community, although they are very secure in the hospital. They have not even seen much of normal people because they are always dealing with pathological or abnormal people – physically, mentally, socially.

So this was born six years ago, and obviously the clinical people were very reluctant and said: "What will happen to the students if they go?" There is supposed to be an accident, and so on. And I said: "When they become doctors they are going into the jungle of life anyway, and there will be accidents – there will be either a social accident or a medical accident or whatever you have."

I would like to outline the objectives here: we really want to expose the student to the reality of life. Here we want them to be exposed to the human, spiritual and social well-being. Here we are not only concerned about the goals for our students, but for them to see the reality of our target population, the social problems that

bring about the ill-health of our people.

This is an exercise perhaps, so that our students will be able to read the community. I always use that word because we could not read a book that would really be summing up, that would relate ourselves to our relevant condition. If we read American books, certainly we will have the principles, but somehow we get the facts away from our own local problems.

The medical student stays for two months in the village. Now here we don't want to make it into a training ground, because we will sacrifice somehow the service, maybe artificialize the service. They have their own cottages of bamboo so they will be on the same level with how the people live.

We started by only using one barrio, now we are expanding to 12 villages. After being drilled here – we start in the classroom, it takes two weeks to get oriented – we fill them into their own villages alone. This I was very reluctant to start because I thought that they would play hookey, but that was the best way of really putting these people into their own sense of responsibility, because the people looked at them now as doctors, and they would expect them to behave like doctors. And that is the force that moulds them, even without their supervisors around.

They start by analyzing the population. Then they go into the economic aspects, and then they go into the social thing. Those are the things we want our students to know because many surgeons in the hospital – we have been accused here – say: "Why are you sending me people already on the verge of bursting appendix?" I say: "Why don't you try to live in the barrios and start persuading people the hospital is good for you people, because from the ward to the operating room is not hard, but from the house to the hospital . . ."

It is very hard to persuade people even at the very edge of death, because they are afraid of what is this monster all about, and, you know,

how much they will charge and so on. So that is very important: the art of persuading people to utilize the health services.

Then they go into educational attainment. Many of the mothers and fathers are illiterate – 20 percent of them have no schooling. So we have to teach the students to adjust their communications towards this mother and father. So now the students are prepared to deal with the people.



Now, what is the immediate intervention program that I can give in this barrio after reading all these problems here? Now I am very definite about it that I want to de-worm 546 pre-schoolers. Nutrition program: I want to elevate the weight of 151 pre-schoolers who have been found to be underweight. In immunization, to immunize 393 pre-schoolers. Now these are the things that I can do immediately, today or tomorrow if I have the resources, then I have done my job for this barrio, rather than the conventional way of going to a village, sitting down and waiting for patients, and if you have no more patients you start itching to go home.

Then the long-range goals – I say long-range because it will take some time for me to motivate 122 families to make use of family planning and to maintain the present acceptors here. Then another long-range objective: I want to improve the existing source of water supply and purify the water storage in the home. Then to establish a continuing parents and youth health education program, and to motivate 152 families to construct sanitary toilets. We consider any community like a patient.

Now in the environmental instruction they go into the toilet situation, the source of water supply, the land holdings, the food production, we even have a teaspoon survey! Only did we realize about the teaspoons when we were here. We kept pre-

scribing and prescribing, and one day I was just wondering: now that's one teaspoon, 5cc, it's got to be exact, and there was one time when I happened to be in a house and really they could not offer me a teaspoon.

Now as a doctor you prescribe an exact measurement of 5cc, one, two, three, four times a day. The mothers will never tell you that they don't have teaspoons. They will just slowly go home and start thinking who among the neighbours has a teaspoon, but you can't borrow a teaspoon three times a day. How do you survey and ask people whether they have a teaspoon or not? That is very sensitive. What we did was we arrange to go to the house: we want to measure your teaspoon because we want to see if it is exactly the amount we prescribe so we are sure it is 5cc. That is the time they will say "We are sorry, we don't have teaspoons, but will a tablespoon do?" OK now we know.

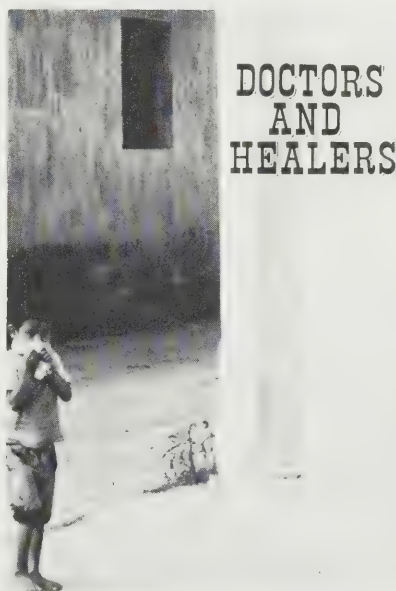
Then there was the can opener survey, because mothers keep saying: "That milk was the one that caused the diarrhea." And we discovered that they open these sterile cans with knives and bolos or nails, and the milk of course is a very nice medium for bacterial growth.

We have designed a village laboratory. It is complete in a box, you can carry it in a jeepney. We designed this pack and now it is going to be nationwide. We did not have a laboratory in our municipality, our doctors were either guessing or maybe blundering their way to diagnosis. You know I have been with the department of health for maybe 20 years and we never think of designing some kind of a contraption in a box like that that would really make it decent enough for our rural health clinics. Only 1500 of them to be equipped with this—a little something that would make them more scientific. That is why many times we are looked down upon by other physicians, because they say: "You are not doing things scientifically."

Now we also have the drugstore kit. You go to a barrio, even if you have one thousand doctors here and you don't have drugs . . . Here they buy it and it is theirs because it is a cooperative. The cooperative says OK, one peso per house, and they love it because they don't want to get out of the barrio and fill in the prescription pad, and they don't even know where to go and how much to buy. Now it is their drugstore.

Review

DOCTORS AND HEALERS, by Alexander Dorozynski. Published by the IDRC, March 1975, 63 pages (IDRC-043e). Reviewed by E. J. Ragan, M.D., M.P.H. Dr. Ragan, who is Medical Director of CUSO (Canadian University Service Overseas), worked in Malaysia under the auspices of CARE/Medico, and is a co-founder of the Tropical Medicine and International Health Division of the Canadian Public Health Association.



Doctors and Healers is a slick, beautifully illustrated booklet written by Alexander Dorozynski for the International Development Research Centre. In a well-researched, provocative style the author describes many of the fundamental issues in the development and support of health care systems worldwide. He questions the need for "western style" medicine in developing countries. He emphasizes the global maldistribution of physicians. He claims that doctors may not be "always essential" since many illnesses are either self-limiting or relatively simple to diagnose and treat. He suggests that a medical doctor may even be a drawback to the development of family planning programs. He traces the monopolistic activities of the medical profession from the 13th century to the present and reveals the "collusion of the elite with the medical monopoly". He underlines the economic anti-development effects of the "brain-drain"—pointing out that the 80,000 foreign MD's who have settled in North America in the past twenty years,

have created what amounts to a staggering reverse foreign aid bill. He cites parts of the world where auxiliaries are doing the job of healing almost as well as doctors.

The medical profession is criticized in sixty of the sixty-three pages of the booklet. On the last few pages innovative health services delivery projects are described that tend to cast doctors in a more favourable light. Why this last minute change of sentiment?

A great deal of criticism is directed at the medical profession for the underdevelopment of health systems worldwide. I find it difficult to accept that doctors are solely to blame. The author neglects to mention the impact of the socio-political system on health. He has forgotten that the control of tuberculosis in the developed world has paralleled economic development more than the development of the health system. What about the effect on health of colonialism and neo-imperialism? The author suggests that, if we tinker a bit with the health delivery system, there will be some hope for the future.

As a physician who has both worked in a developing country and who has worked through many of the author's ideas, I feel that his thoughts can be classified as contemporary medical liberalism. Can an innovation in health care delivery—the medical auxiliary, Medex, health promoter—solve the problems of poverty, oppression and forced dependence?

Who is going to read this booklet—the medical profession or the public? If it is for the medical profession in either developed or developing countries, the majority would be insulted and indignant. If it is for the public, many will not understand.

In my opinion, "Doctors and Healers" raises some interesting questions about health care delivery systems but falls short by presenting an unrealistic, biased view of doctors and their singular influence on the system. The author did not include references or even a description of the background contacts, meetings and situations that formed his opinions.

This booklet presents an opinion about the underdevelopment of health systems in an artistically prepared package. There are other viewpoints and there are other strategies for solving some of our health problems—many of which are not medical.

Commentary

Which values are for export?

by Farida Shaikh

In the wake of the Indochinese debacle, one lesson should be abundantly clear: Beware of the palliative that precludes a cure. The magnitude of the mistakes committed in Vietnam and Cambodia makes them memorable, not the fact that there were mistakes. Errors of judgement, the application of short-run solutions to problems whose complexity and interconnectedness have not been properly understood, are not new.

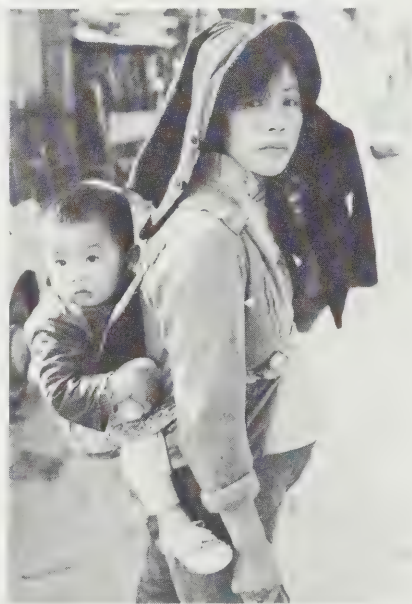
Development assistance is full of such errors.

This is not to suggest however that all aid has been ill-motivated or poorly applied. Merely that, because the approaches used in aid projects and by technical advisors often serve as models in developing countries, donors have a special responsibility to ensure that the impact and costs of their advice are seriously considered before it is offered. The question of women, of their role in the development process and in society, is one in which the biases or lack of interest of policymakers on both sides of the aid barrier may impose high costs on generations to come.

Women are a fashionable topic at the present time. The UN has declared this their year. Speeches are made, articles written and conferences held to discuss the barriers to their full participation in society. The public relations bandwagons roll through developed and developing country alike. But leaving aside the rhetoric, what is being done? Not enough.

In some countries, the majority of women are born and die within the confines of a single compound. Swathed in clothing from head to foot, they are denied the right of choice on any issue—their marriages, jobs, the number of children they produce or even the simple pleasures that come out of exercising curious and energetic minds. The rationale? The notion

that the purity of a woman must be protected both from her own unstable nature and from that of an intruder. This dualistic approach to woman's sexual and moral nature, the concept of simultaneous good and evil, is strongly rooted in all three major monotheistic religions. It is reflected in prejudicial laws and policies that circumscribe the freedom of women in eastern and western countries alike and is rarely challenged by aid dispensing agencies or nations.



The women who watch pessimistically as International Women's Year rolls on must be forgiven for their cynicism.

In other regions, women have traditionally played important economic and social roles. Agriculture, marketing and sometimes even politics have been their past provinces. However, instead of reinforcing them in these roles and integrating them into areas where they have previously been excluded, colonial policies, western-

trained specialists and aid projects have frequently had a negative effect. Men, not women, are generally recruited for training and high paying jobs in trade, commerce, management and farming. The reasons? In some cases, it simply does not occur to male advisors to consider women for these jobs. In others, policymakers who believe that women are the physically weaker sex decide that women would be better off if removed from positions that demand hard labour or long hours and were left to tend their homes and children. Individual men or women might well benefit from the removal of back-breaking work that yields a small product. But as a policy precedent for all women this solicitous approach leaves much to be desired.

In still other areas, women possess a considerable amount of social autonomy without enjoying corresponding political and economic privileges. Here, once again, the dispensers of development assistance tend to be silent.

The women who watch pessimistically as International Women's Year rolls on must be forgiven for their cynicism. When a woman's worth is still measured by the number of male offspring she produces; when a victim of rape is still judged to be guilty; when a fully grown female still loses the economic and decision-making privileges upon marriage; when a woman is still paid less than a man for doing the same job; when these and a host of even more basic inequalities are left untouched, how can one be other than pessimistic?

The fault lies not with women nor with those diligent national and international civil servants who are working towards the smooth conduct of this year's conferences. It lies, instead, with those who offer the conferences as an alternative to real change.

International Women's Year was born in cynicism and it will most likely whimper out in the same spirit. The social planners, engineers and agriculturists were not responsible for this year's public relations theme. They simply did not think of it. The credit goes to the demographers and health professionals whose zeal for population control exceeds their disinclination to become involved in the women's struggle for basic rights.

Women produce babies. Educated women, and especially those who play an active part in the economy, produce fewer babies. Therefore, out of World Population Year came the idea of a period of time devoted to raising the status of women. But can the occasional photograph, the appointment of a few female bureaucrats to positions of authority and a series of meetings really succeed in lowering fertility where countless posters, demonstrations and family planning campaigns have failed? And is such a goal valid?

Unfashionable though it is to cite a higher authority on questions of politics and economics, the only valid reason for examining the position of women is one that has the force of a moral law. We have, in this century, proclaimed and accepted as a moral precept the notion that all human beings are equal in their worth and in their right to equality of opportunity. The rights and freedoms of women must be defended because women are as worthy members of the human race as black, white or brown men, not because of their roles as producers of children, wives or cornerstones of the nuclear family.

What is Canada's position in relation to Third World Women? So far, not very strong. Not one of the three major governmental or non-governmental development agencies has seen fit to inform the Canadian delegation to the IWY conference in June of the issues of importance to women in developing countries, of the impact of Canadian programs on their lives and aspirations.

Few projects, other than the ones that have population control as an explicit or implicit goal or that involve handicrafts, address the needs of these women as producers, decision-makers or fully participating members of society. To a limited extent, this lack of concern can be justified. In most developing countries, the gap between the opportunities available to wealthy women and poor men is far greater

than the gap between those available to poor men and women. At the same time, the gap between the economic, social and political positions of men and women does exist and it is almost always to the detriment of women.

Another possible justification for the inertia of Canadian policymakers is that Canada does not consider it valid consciously to impose new cultural norms on other peoples through aid. There are two ways to counter this argument. First, some projects do transfer the Canadian biases of policymakers quite openly. In West Africa, for example, although women traditionally play major roles as agricultural producers and traders, Canadian funded projects frequently help to strip them of these roles. Secondly, most aid, indeed most commercial and non-commercial transactions of every type, transfers culturally rooted values, norms and techniques. The question then becomes which values are for export?

Within its own borders, the Canadian government has recognized the principle of equality between men and women. Canadian women are strug-

gling hard to institutionalize this principle in law as well as in practice.

It is the responsibility of the Canadian government to ensure that its own development agencies and the ones it funds respect this principle in the formulation of projects and policies. Canada cannot, and indeed should not, interfere in the domestic affairs of other countries to the extent of attempting to impose her cultural norms where they are patently unwelcome. It is however possible to support the progress of existing women's movements in other countries. At the very least, Canadian-funded programs should not undercut the favorable economic, social and political positions of women where such situations already exist. To do so would be to transfer the worst of double standards: a policy of equality for Canadian women and one of gross inequality for the women of Asia, Africa and Latin America.

Farida Shaikh is a freelance writer who was formerly with the IDRC's Office of Public Information.

Sharing the load in Cuba

Cuba's working wives may soon be able to bring the full force of the law to bear when they want their husbands to help around the home. The island's government is proposing a new Family Code which will require the husband of a working woman to perform his full share—at least 50 percent—of the housework and child care so long as his wife holds a full-time job.

The aim of the code is to encourage married women to go out to work, thus increasing the productive proportion of Cuba's population, according to Prof. Barent Landstreet Jr., of Queen's University Department of Sociology, who has made a study of population issues in Cuba. It is one example, he says, of the way in which the Cubans, having rejected the principle of population planning, are attempting to tackle population problems indirectly through economic and social planning.

Cuba has no policy which sets out to maintain a specific population growth rate. Although birth control services are readily available at no cost even in the remotest areas of the country as part of a comprehensive

health service, yet the government expresses no interest in population control. It is, says Prof. Landstreet, "a little island of *laissez faire* policy in an otherwise highly planned society."

Taking a similar line to that adopted by the Soviet Union, Fidel Castro declared in 1968: "The philosophy of imperialism is that people are not to make revolutions and the women are not to give birth." Although there have been signs recently of a slight shift in Cuba's position, the official position is still that birth control programs in isolation are useless—they must be related to structural social and economic changes.

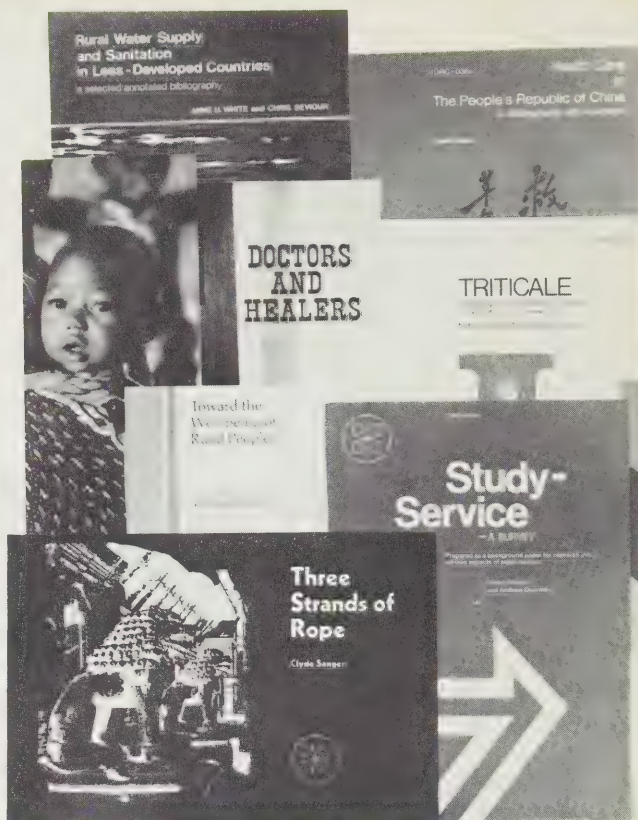
Hence the attempts to increase family labour, control of migration to the cities, the use of "volunteer" and military labour, and the expansion of the work-study system of education, an experiment which began in the high schools and is now moving up to the university level and down to the third grade level. Cuba's unique experiment, says Prof. Landstreet, is in trying to change the employment structure of the country, rather than changing its age structure.



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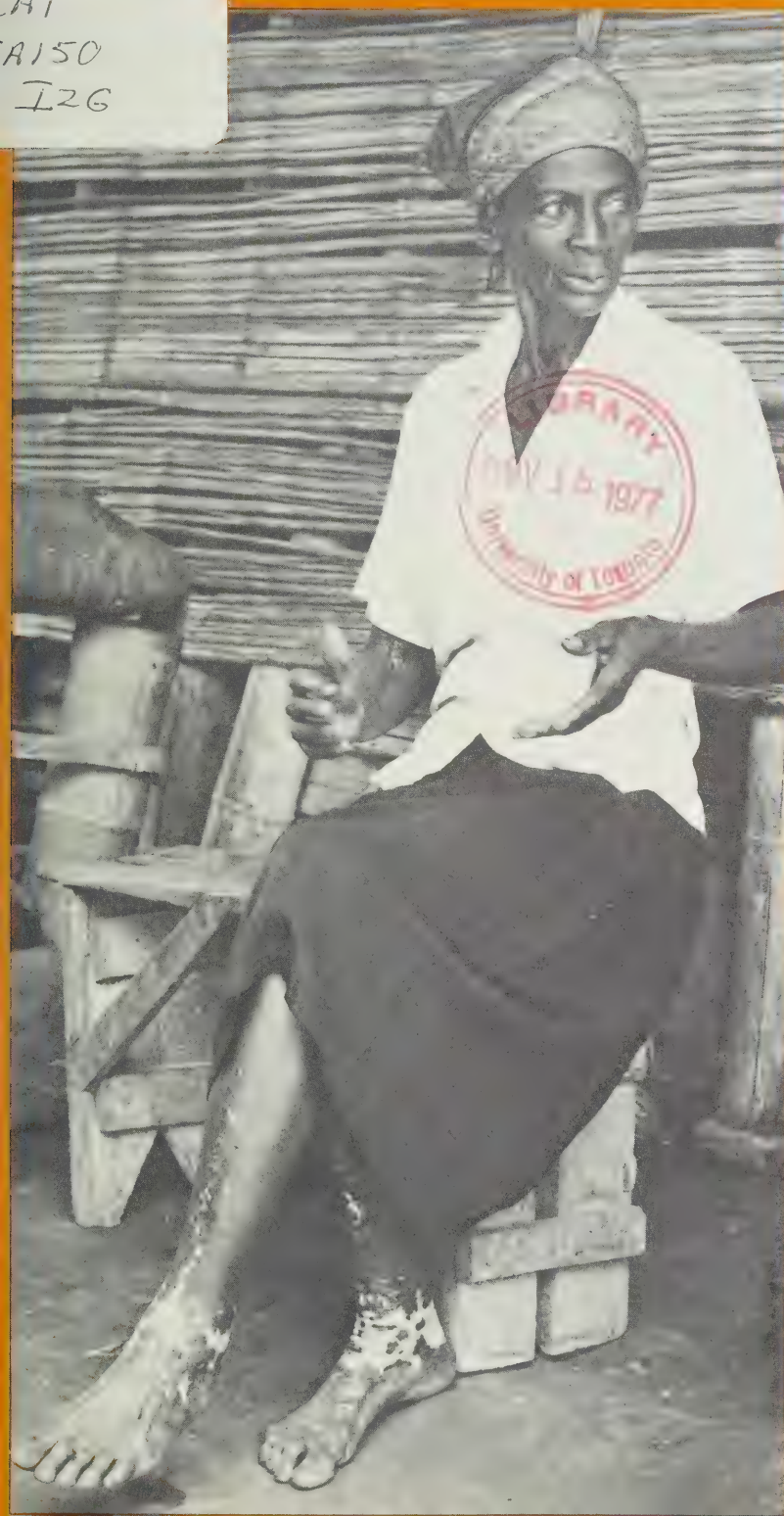
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Reports

VOLUME 4 NUMBER 1

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**Science in the
Middle East**

**Rural development
in Colombia**

**Street traders in
Asian cities**



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The IDRC

Reports

VOLUME 4 NUMBER 3

September 1975



CONTENTS

Arab awakening

A series of articles in which Alex Dorozynski reviews new scientific developments in the Middle East.....

5

— Food from the Desert?

— Paradox: King Faisal Medical City

— Over the dam and into the depression

More than a business... a way of life

Photo features

11

Waste not, want not

Report by Barry Nestel on new energy sources from plants

14

A new approach to rural development

Susana Amaya describes Colombia's CIMDER project

16

Regional News

Reports from Beirut, Bogota, Dakar, Singapore

18

Briefs

People, projects, events

20

Review

Hawkers and Vendors in Asian Cities

21

Commentary

Tilting at Windmills? by Dennis Schroeder

22



Scientific awakening in the Arab world

Some of the countries in the Middle East are among the richest, and at the same time, the poorest, in the world. In recent years, economic changes in the region have provided the means to bring about swift technological and scientific progress that is an essential component of the social process of development. The following articles specially written for "The IDRC Reports" by author and journalist Alexander Dorozynski, attempt to give an overview of this awakening.

Dr Mohammad El Shamali sketches a square and labels it "research." An arrow leads to another square, "development."

"In short," says the dynamic director of the Kuwait Institute for Scientific Research, "this is what we are doing here . . . Of course, we're looking for projects particularly suitable or useful to Kuwait."

He pauses for a second, then under the small square adds another, bigger one, with arrows pointing upward.

"In fact, what I said isn't quite true. We are trying first to build up this: a tradition for research. It's the first step, and perhaps the most difficult one to take."

In a nutshell, this is the recognized goal of a number of Arab countries that find themselves today at a unique crossroads of their destiny. After 1,000 years of dormancy and a century of foreign domination, they are coming awake to the modern world. They realize that the sudden injection of oil wealth must be taken advantage of, not only to import goods and for-

eign technology, but to achieve the leap from the past to the present, and give a growing population, most of it living on arid, poor land, a chance to reach the so-called "take-off level" from which continued self-development becomes possible.

It is common knowledge that some of the oil-rich Arab countries have some of the highest per-capita incomes in the world. But, subtracting the oil revenues and counting only what is earned by labour, per capita income is among the lowest in the world.

In some quarters, the new wealth, understandably, has given rise to a heady feeling. But the realization that this is a dangerous short-term situation has come quickly: the importation of material, techniques, technicians and scientists cannot, alone, lead a developing country through the decisive steps that will allow it to develop its own resources, including human ones.

In the Middle East, the industrial and scientific revolution has started, sometimes in a spectacular fashion. Middle Eastern countries, particularly oil-producing ones, remain excellent customers for Western manufactured goods and technology. But, in an amazingly short time, a number of developments have given realistic hope that, by the time oil runs out, self-reliance can be achieved.

Some years back, a favourite story was that of the oil-rich desert prince discarding his Cadillac when the ash-tray was full. Now factories in Saudi Arabia completely rebuild cars, and agreements have been made to establish assembly plants in the kingdom. Some of the parts will be manufactured on the spot.

Riyadh has a faculty of pharmacy, and production of pharmaceuticals is expected to start this year. The General Petroleum and Mineral Organization (Petromin), a public corporation owned by the state, runs a steel rolling mill on the Red Sea coast south of Jiddah. Local cement factories already supply half of the demand, and locally-made paper cement bags are exported. Fertilizers and polyethylene bags to transport them are produced, asbestos pipes manufactured. A modern factory in Jiddah produces carpets as well as prayer rugs for sale to pilgrims.

Aluminum railing and frames, pipes, plastics, are produced in the Gulf States. In Bahrain, aluminum ingots and powder are made from imported bauxite and exported. Kuwait has an aluminum smelter, clothing and household goods factories, plans making prefabricated houses and building materials. Hydroponics-produced vegetables now reach the market.

Evidently foreign management and specialized labour are still prevalent; but increasingly, Arabs from the desert drive trucks, tractors and cranes rather than camels, and learn to rely on computers rather than stars.

As if by some quirk of fate, oil has gushed in the less densely populated, most deserted parts of the Middle East, that had been largely isolated from the West and where ancient traditions were most strongly maintained.

In countries not blessed with the wealth of oil, development has also been significant if more gradual; more often than not, there had been a head start.

In Jordan, Iraq, Syria, there are plants and factories producing pharmaceuticals, cement, paper, steel pipes, textiles, glass, chemicals, plastics and household appliances. Jordan has its Royal Scientific Society with its computerized centre for development planning, and progress has been rapid, perhaps even more than if things had come easily. (At a meeting of the RSS, Sharif Zeid Hussein, cousin of Jordan's King Hussein, was quoted in a significant quip: "The worst thing that could happen to us would be to discover oil.")

Egypt and Lebanon are, with regards to science and technology, in a privileged position. Both have an academic tradition, and universities of international calibre.

Egypt

In Egypt, Cairo and Alexandria University, each with an enrolment of about 50,000, dispense mass education to other Arabs as well as Egyptians. Original work in fields such as medicine, engineering, electronic engineering and physics, is up to international standards, and research projects, can be highly sophisticated. For instance, Dr Ibrahim Mandour, of the Electronic Engineering department of the University of Alexandria, is studying the possibility of taking advantage of air pockets along the course of the Nile to bounce microwaves for communications between Cairo and Aswan.

Computer research here is the most advanced in the Middle East. Dr Abu Taleb, chairman of the Computer Science department at Alexandria's

Faculty of Engineering, mentions current work to develop Arab language output, notably for business administration. (The computer business language, COBOL, may lend itself to adaptation in the Arabic script).

Medicine has reached a high level, perhaps too high for the demand, as witnessed by the number of physicians emigrating both East and West. Research in heart disease and some aspects of cancer meets any standards.

Nuclear physics is actively pursued, and there are plans to produce nuclear energy in substantial amounts before the end of the century. The appointment of Prof. M. A.-M. Gebeili, a nuclear physicist, as Minister of Science, may help to boost projects that today may appear somewhat ambitious.

One is tempted to relate Egypt's present role in science to its prestigious past. But then, it should be remembered that the ancient Egyptians not only produced some of the world's first scientists, but also invented scribes – a commodity that has remained, in its modern version, pervasive. A considerable number of man-hours appears to be used up in filling forms in triplicate, making reports and circulating them, or trying to find out which ministry, university, department, or administration has the responsibility for such or such project.

Statistics are numerous but seemingly not always consistent. Some figures, by the time they have benefited from the services of ranks and files of scribes, become outdated. Responsibilities for research policies

seem to be shared between the 14 centres of the Academy of Sciences, universities, ministries, and the military (the latter, for instance, control weather). But there has recently been a visible effort to simplify the pattern.

President Anwar Sadat has been quoted as saying: "I consider the expenditure on scientific research and technology as important as investment in heavy industry." In recent years, extreme emphasis on industrialization at the expense of agriculture appears to have been abandoned for a more balanced approach, in which even the social sciences play an important role. An interdisciplinary program taking into consideration architectural, sanitary, economic, social, educational, artistic, psychological and other aspects, has been initiated; and a dozen pilot villages have been established in various regions to study the problem of migrations, new settlements, and the transition of the traditional agricultural pattern to a modern one.

One problem remains thorny: that of population growth which, insofar as individuals are concerned, wipes out much of the increase in national wealth. A national family planning program was started in 1965 and benefited from high level government and religious support. In five years the birth rate came down from 42 to 36 per thousand, but other priorities took over and the effort wanes. Dr Khalil Mazhar, chairman of the Executive Board of the Supreme Council of Family Planning resigned in 1970. Since then, the birth rate has been stationary, and Egypt has one of the highest demographic growth rates in

Kuwait: hydroponics produced vegetables now reach the market.



Egypt: hydraulics is a problem science.



the world: the population grew from 19 million in 1952 to 37 million today, and some fear that the doubling time of 23 years may be further shortened.

Another "problem science" is hydraulics (it is, for that matter, an unfashionable science in many other parts of the world). It is of particular importance to Egypt (as witness the predictable but unpredicted water-logging and salination of thousands of acres of newly irrigated land west of the Delta) and to the rest of the Middle East. Reliance on foreign experts, often accustomed to different circumstances, can be risky.

Egypt's scientific background and talent is precious, as much of it filters to other Arab countries in the form of a drain that is accepted as part of Egypt's role of "big brother." Many students from the Arab world can be found in Cairo and Alexandria, but even more Egyptian physicians, engineers, physicists, biologists and other specialists, are working under contract in teaching, research, and executive positions on the Arab peninsula.

Lebanon

Lebanon, which hosts the Centre's regional office for the Middle East and North Africa, also has a special role. Small, almost entirely devoid of natural resources, and a commercial hub of the Middle East since the time of the Phoenicians, it has a strong academic tradition (notably the American University in Beirut) where not only Lebanese, but many expatriates have earned degrees.

Most Lebanese would agree with Dr Joseph Naffah, secretary general of the National Council of Scientific Research, that science *per se* does not have much prestige, and that this bastion of free enterprise, bordering on sheer laissez-faire, attaches more importance to financial success and to practical and moneyable realizations of science and technology, than to academic palms, international recognition, or the value of science as an integrated part of development.

The approach, thus, is a practical one—not much emphasis on pure science and high-faluting technology, but rather on productive research and industrial expansion. The practical approach is reflected by the policies of the National Council of Scientific Research, whose president, Prof. Joseph Naggear, candidly admits he will

Food from the desert?

Even under an annual rainfall as low as 100 mm, the desert is never completely devoid of vegetation. After the rainy season, it can grow green, yellow, purple and pink. For centuries it has supported nomadic life, made possible by knowledge transmitted from generation to generation.

Today, overgrazing has all but destroyed some of the plant species, particularly the annual plants that are not given a chance to grow to maturity. Little is known of most of these plants (several hundreds of them) except that a little protection, a little care, and a little water, can make them grow like Topsy.

Dr Mohammad Al Shamali, director of the Kuwait Institute for Science Research, has long been intrigued by their potential use, and now a small team of researchers has undertaken a study with the hope of developing inexpensive, locally grown roughage for cattle.

Under the direction of food scientist Ibrahim Hamdan, the project has branched out in several directions.

- Identification of plants, many of which are the same as those found in other semi-arid regions (Australia, Arizona, Chile) and about which data is scattered.
- Determination of their nutritive value (content in carbohydrate, proteins and crude fibre) and, eventually, their toxicity. (One perennial plant, *Atriplex*, was found to have a protein content of 16 percent, as high as alfalfa.)
- Their potential utilization.

Experiments on KISR grounds and in greenhouses have shown that even a slight improvement of the harsh conditions these plants are accustomed to can greatly increase their growth rate. Some perennials grow as tall as a man. And analysis has shown that some of them may be suitable as an economical substitute for more classical grazing plants that are more costly to grow in the semi-arid tropics. KISR researchers are now attempting to create an equilibrium between some desert bushes, annuals, and perennial plants; plants imported from regions with similar conditions have been included in the study. It is hoped that a combination of different characteristics may permit a symbiosis between, say, a deep-rooted shady bush, a resistant perennial, and a succulent annual.

Once this preliminary work is completed, experiments with cattle will be undertaken to find out the best way of completing this roughage with other locally-available food, such as single-cell "petroleum proteins," or algae (which are also experimentally grown at the Institute).



Prof. Hamdan with plants.

Desert plant research has also branched out into the study of hormone-like plant growth promoters and soil enzymes that could improve fibers through the fermentation process.

But this is not all. Toxicology studies have led to the identification of alkaloids and other substances, some of which have been analyzed by chemist Ali Anani. An intriguing aspect of the potential of these substances came to light in the particular context of traditional Kuwaiti medicine, probably an offshoot of ancient Arabic medicine, still practiced by a number of healers called *attarin*, who apparently coexist with free medical services provided by the state. The *attarin* use herbal medicines whose effectiveness has time and again been demonstrated, but they jealously guard their secrets, transmitted from father to son, and even, it appears, mix several inactive ingredients in their preparations to camouflage the active ones.

Already, some plants have been shown to possess antibacterial activity. Soil bacteria and fungi (of which 160 species have been identified in the country) have also been included in the study. An international pharmaceutical firm has shown interest in testing some of the substances. In the meanwhile, the Kuwait Institute for Science Research has acquired 20 square kilometers of desert to push on with the initial cattle-feeding project.



Aquaculture: shrimp breeding station in Kuwait.

not propose too costly, ambitious prestige projects, but retain the social and economic interests of Lebanon and the Middle East as the principal criteria for selection.

This does not mean that sophisticated science and technology are out. Middle Eastern Airlines, the country's largest employer, is not only a profitable airline, but runs a maintenance base at Beirut International Airport where a modern jet can be practically taken apart and put together again; this facility caters to several international airlines. Another example is the recent creation of an artificial kidney centre with a 90-patient capacity (and entirely free of charge).

A significant contribution to science and technology in the Middle East comes from the Arabs without a country – the Palestinians, many of whom, in the past quarter of the century, have roamed the world and boast degrees from Egyptian, Lebanese, American, or European universities. Some have settled in the West, but others are drawn back to the Middle East, and Palestinians can now be seen in almost every university or research centre on the Arab peninsula as well as in international organizations such as the FAO or UNESCO.

Bahrain

There is no denying that, in recent years, the most spectacular changes have taken place in the oil-wealthy countries of the peninsula, which had been largely isolated from the West. It is there also, now that the process has started, that continued change at a very rapid rate is essential to eliminate illiteracy and build a scientific and technological backbone.

A small-scale example of what can

be achieved is provided by Bahrain, the small peninsula-state where oil was found in the early 1930s. Bahrain now has more than 100 schools (for a population of 220,000), and vocational training centres. A sign of progress is that oil revenue by now only represents about half of national income. In the process, Bahrain is becoming a small Switzerland (or a Beirut) of the peninsula.

Kuwait

Kuwait, with its Institute for Science Research, is pioneering the research centre idea in the area. Most of the staff are imported, but young Kuwaiti graduates are being integrated into it and learn to function as members of a team. In Kuwait, the tradition that isolates half of the labour force (women) from the mainstream of life seems to be being gradually overcome. Veils are seldom seen in the streets, and female researchers, secretaries, and other employees are a fact of life. One problem may be excessive wealth, that may undermine the incentive to work; but there is some awareness of this, and educators as well as researchers start emphasizing promotion and reward for effort and achievement.

Saudi Arabia

Saudi Arabia, from where Mohammed's first converts rode and within a century conquered an empire from Spain to Central Asia, is rapidly changing its face. Twenty years ago, the only centre of higher learning in this ancient, traditionalist land, was the Islamic Studies Faculty, founded in Mecca in 1947. The University of Riyadh was founded in 1957 with a teaching staff of nine. The College of Petroleum and Minerals was set up

with the aid of the Arabian American Oil Company in 1963, and the Abd al-Aziz University was founded in Jeddah in 1967 as a private institution sponsored by a group of businessmen and political leaders.

Now Riyadh University has eight faculties (arts, education, sciences, business, pharmacy, agriculture, engineering and medicine), an enrollment of 6,000 students, and a library of some 200,000 volumes. The faculty of sciences publishes a bulletin that covers subjects from climate and flora of Saudi Arabia, to studies of electron spin resonance. Already, Prof. A. A. Al Khayal, dean of the faculty, feels cramped for space, looks forward to moving to the projected new campus, and voices a complaint familiar to academic circles around the world: lack of funds.

The CPM (whose chairman is well-known Sheikh Ahmed Yamani, minister of petroleum and minerals) teaches sciences, engineering science and applied engineering, and has an enrollment of about 1,000. The Abd al-Aziz university teaches arts, sciences, business and administration; now integrated under the Ministry of Education, it has more than 2,000 students.

Thus in a relatively short time, while primary school has become compulsory, a university-level education has been made available to Saudi youths at home.

True, the teaching staff is largely imported, and universities remain quite different from Western ones. There is much concern about protecting the traditional and religious values, and no room for student revolt or permissiveness. There is a shortage of women professors, and this is an obstacle to educating women, who may not mix with men after the primary school level. But both of the new campuses planned for Riyadh and Abd al-Aziz include separate campuses for women, and in the meanwhile, audio-visual contact between the sexes has been accepted so that women, theoretically, can have almost equal but separate opportunities for learning.

At the same time, science-awareness is spreading through the Arab world, from Morocco to Yemen, by ways of clubs, discussions and conferences. There may be a long way to go but, to an outside observer, the start seems to be a good one, and progress amazingly fast.

Paradox...

Nowhere is the attempt to achieve a technological and scientific leap from the Middle Ages to the 20th century as evident as on the outskirts of Riyadh on a 35-acre plot that used to be part of the Royal Palace's fruit and vegetable garden.

Here, in a mere four-and-a-half years, was erected and equipped the King Faisal Medical City, dominated by an elegant modern 250-bed hospital faced with honey-gold stones cut in a desert quarry 100 kilometers away. The City was conceived by King Faisal himself as part of his dream to help his country across the gap separating it from the modern world. He laid the foundation stone in November 1970, and the hospital was formally inaugurated last April—less than three weeks after his assassination.

Few medical projects anywhere have been as ambitious, or as controversial. Dr Rifat Alsayed Ali, personal physician to the royal family, who selected the medical equipment and supervised the installation of the hospital, envisions it as a seed to the development of medicine in the Arab world. The idea is not just to provide a sort of Arabic Mayo Clinic, but to fertilize rapid medical progress with the help of top foreign experts.

In a way this is what happened some 1,200 years ago, after Calif Haroun Al Rachid founded the first hospital in Bagdad, and Arab medicine rapidly absorbed and developed the Hippocratic medical tradition which had dominated the world. To some extent it may also be likened to the fertilization of American science by foreign migration during and after World War II.

At any rate, in Riyadh no effort or expense has been spared to create favourable working and living conditions for the 750 specialists who have started arriving on two-year contracts. Eventually there will be a staff of 1,200, capacity will be expanded to 500 beds and there will be a clinical research department.



The superbly equipped hospital may appear as a paradox in a country where the first group of doctors from the first medical school has yet to graduate. But then this is not inconsistent with a philosophy that some Saudis have called the Faisal school of thought: "given the will and the means, it is possible to start where knowledge ends."

One of the key elements in this impressive array of modern medical technology is a computer centre linked with 14 internal computer systems so that, from the start, a patient's record is kept up-to-date and remains instantly retrievable. Computer processing is also available for diagnostic tests in clinical biochemistry, audiometry, electro-cardiography and encephalography, electro-oculography, electro-myography and other procedures.

Similarly, the rest of the equipment is probably as sophisticated as can be found anywhere, and the specially designed audio-visual system is probably one of a kind. It even includes a fully-equipped four-channel colour broadcasting studio with facilities for recording, editing and producing video-tapes. There are plans to produce and broadcast a public medical and hygiene program to be aired on Saudi Arabian networks.

The hospital and surrounding city have their own power supply system of eight heavy-duty gas turbine generating sets. Surprisingly enough in this oil-rich country, the system is "energy-conscious"—waste heat is recovered to produce steam for the air-conditioning condenser units.

While medical services in the country are free of charge, the King Faisal hospital will be a paying one. "Otherwise," points out Dr Ali Rifat, "everyone will want to go there rather than to another hospital. But if any patient requires facilities or treatment available only here, he will be admitted as a free patient if he cannot pay. No one in need of specialist services will be turned away."

It is too early to say whether the gamble that the Medical City represents will pay off in the expected terms. How long will "Saudization" take is the most difficult question to answer, although a crucial one.

The first medical school in the country was opened in Riyadh in 1969 with an initial enrolment of 35. Now it has risen to 60, and, for the first time, women medical students are accepted (tradition does not allow them to be taught by men, so they follow courses in a separate classroom via closed-circuit TV, and ask questions by telephone).

There is, however, no teaching hospital for clinical training, and plans for a university campus (rather, two—one for men and one for women) do not appear to have been given the top priority accorded the King Faisal Medical City.

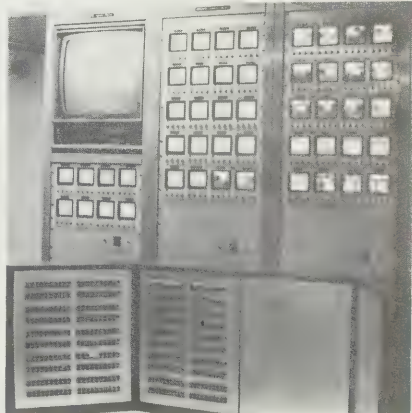
Work on the campus is scheduled to start this year, and it is expected that the faculty of medicine will be the first to move in, in 1978. If the effort is continued, this example of a scientific and technological leap across several centuries may well establish a record.



Computer interprets electrocardiograms.



Portrait of King Faisal in hospital lobby.



Closer circuit TV monitors hospital rooms.

Over the dam and into the depression

Some of the largest and oldest of the world's irrigation systems have caused waterlogging and leaching out of salts from the soil. Studies covering a period of 4,000 years (from 2600 BC to AD 1400) of written records in Mesopotamia indicate that such "side effects" are recurrent. Salinity surveys were started there in about 2400 BC but nevertheless, the history of the region is punctuated by the rising of saline waters to plant root level. Many historians believe that agricultural catastrophes, rather than wars, invasions, or climatic changes, have precipitated the fall of some of the first great civilizations in the "fertile crescent." In India likewise, 4,000 year-old surface salt traces, signifying similar agricultural decline and fall, have been found.

It may seem surprising that the problem has not been solved by modern science. In the 1950s and 60s, thousands of hectares of irrigated land in India were lost to salination. And today, Egypt faces the same situation, whose solution is essential not only to meet the agricultural needs of the country, but to the successful carrying out of vast irrigation schemes, now underway or projected, in

the semi-arid regions of the Middle East and Africa.

Salination of land is the latest and perhaps the most severe side effect of one of the world's largest water management undertakings, the High dam at Aswan and related developments. This year the dam is a major subject of public debate, and the target of a parliamentary investigation ordered by Sayed Marei, president of the National Assembly (who headed the World Food Conference in Rome last November).

The Aswan dam has been the subject of violent criticism, some of it ignoring a major achievement: the Nile valley farmer is no longer subjected to the sometimes deadly vagaries of the river. Year-round irrigation permits the growing of three or four crops a year on land where only one had been possible in the wake of the annual flooding of the past. The dam stands in the way of disastrous floods, and provides water in periods of drought. This was illustrated two years ago, when the natural flow of the Nile was the lowest in about 100 years.

Nevertheless, it is true that this pharaonic project (masonry at Aswan

has a volume 17 times greater than that of the Cheops pyramid) has cumulated almost every conceivable side-effect in addition to the waterlogging and salination of irrigated areas, which started manifesting itself in the Nubaraya region, some 50 kilometers south-west of Alexandria.

When the Nubaraya irrigation project was initiated, a study of underground water tables was envisaged, but it was not considered as urgent, since most aquifers were at depths of between 20 and 60 metres. A network of canals was dug and the water was pumped step by step to a few metres (and occasionally as high as a few tens of metres) above sea-level, to be distributed through secondary canals. The desert started growing green over an area of some 200,000 hectares, about 40 percent of all new land whose reclamation had been made possible by the High dam. Cultures included one-third fodder (chiefly alfalfa), one-third fruit, and one-third field crops and vegetables.

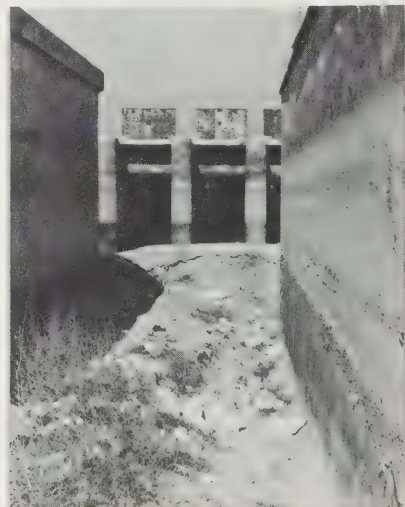
When, a few years ago, some trees and grape vines in limited areas started dying, inadequate use of fertilizer was first suspected. But it soon became evident that abundant irriga-



Healthy canal: ten years ago this was desert.



Sick canal: intensive research is underway.



Abandoned canal: the short-term solution.

tion had made water tables rise at a fantastic rate, sometimes exceeding one centimetre a day, or four metres a year. Saline groundwater percolated to the surface, overflowing into main irrigation canals, some of which had to be abandoned, and even threatening nearby low-lying fertile land in the Nile delta that had been cultivated for thousands of years.

Now hundreds of hectares have to be put out of cultivation every year and many farmers, complaining that "the harvest burns," leave the land that had been allocated them.

No long-term solution has yet been found. Drainage canals would have to be so deep that their cost is prohibitive, and digging wells to pump underground water out to sea is, likewise, too costly. Short term solutions include less abundant irrigation, constant monitoring of salinity, and closing some of the canals.

Intensive research is underway to find an answer, and also methods to foresee and prevent such potentially catastrophic situations. But in many respects, the Aswan dam's side effects point to the fact that water science, or hydrology, has remained largely empirical, and has not benefited from sufficient research.

(The year 1975 brings to a disappointing close the UNESCO-sponsored "Hydrological decade"; as is pointed out in a recent FAO report (Man's Influence on the Hydrological Cycle) "resources being devoted [to it] are sadly inadequate, and in spite of the efforts being made, progress is disappointingly small. The lack of fundamental information on the part of high-level decision-makers is often quite incredible.")

The decision of Egypt's political leaders to open the High dam debate appears as a significant step toward unprejudiced understanding of a project that, sooner or later, had to be carried out (unless one took the position that because of the magnitude of the task, nothing should be ventured, nothing risked, but nothing gained either). Now a holistic approach has been taken whereby agricultural, chemical, biological, geological, hydrological and other consequences of the dam, as well as its social and public health implications, will be studied and integrated on computer models.

As a technically and scientifically advanced developing country, and also one where good water management, in the face of rapid demogra-

phic growth, can make the difference between subsistence agriculture and sufficiency, Egypt may be a key contributor to hydrological science, particularly concerning its applications in semi-arid tropics and on sandy soils.

The High dam experience may have something to do with Egypt's cautious approach to another spectacular project, the flooding with sea water of the Qattara depression in the Western desert, a development that could produce five times as much electricity as the Aswan dam, and lead to the creation of agricultural and industrial centres and a large harbour near El Alamein, the site of a crucial World War II battle.

The project was, in fact, first suggested by Friedrich Bassler, a hydraulic engineer and professor at Darmstadt University, who was a young officer in Rommel's Africa Corps during World War II. In 1941 he had made a cursory inspection of the depression while studying various possible routes for the German army, and he has returned to the site several times since.

The depression starts about 70 kilometers south of El Alamein, curves west and then south for some 300 kilometers and, at its deepest point, reaches 133 meters below sea level.

The Qattara project involves the digging of a 40 kilometer-long canal from the Mediterranean to the northernmost tip of the depression. Water rushing from the sea would generate electricity, and eventually create a 14,000 square kilometer artificial lake. Water would then evaporate at a rate compensating for

the inflow through the turbines.

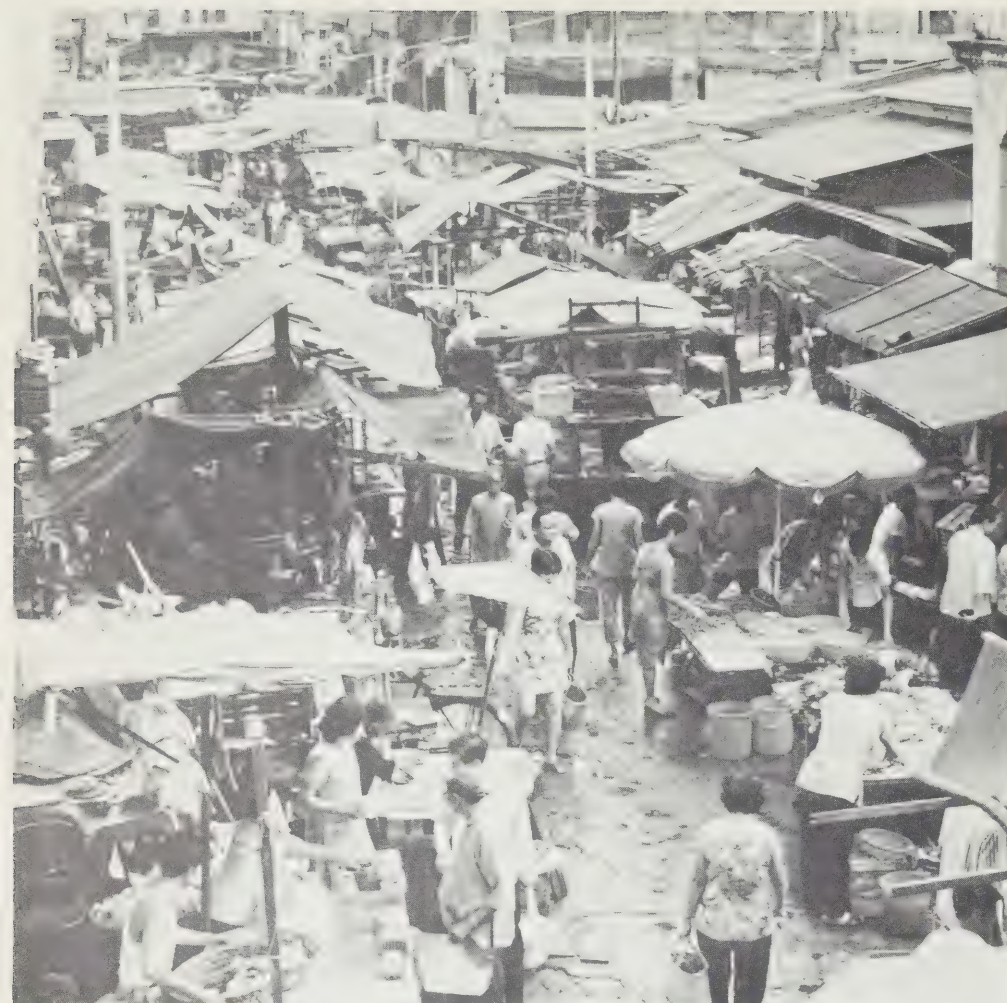
The potential of the project, to be developed over 20 years, is enormous. Floating platforms could be used to drill for oil believed to exist under the depression (at present the oil is of difficult access because of salty swamps on the surface). Petrochemical industries would be created, and part of the electrical power generated would be used for water desalination to cultivate the desert. Oil would be exported to Europe through the canal and the new harbour. The canal could also be used for fishery and aquaculture, and a network of roads would be built for the area.

The Federal Republic of Germany has contributed funds for a preliminary study, and work on the Qattara project could theoretically start in two years. But the Ministry of Power has decided to form a council of experts, both Egyptian and foreign, to study not only the technical, economic and social aspects of the project, but its possible side effects. These could also be spectacular. Evaporation combined with the constant inflow of sea water would increase salt concentration to turn the lake into a "dead sea"; salt water under pressure might leak, through geological faults or fissures, to nearby agricultural areas; or else make existing water tables rise, either to feed fresh water artesian wells, or provoke a salination effect similar to that occurring in the irrigated areas west of the Nile delta.

There are many faces to a water management project, and Egypt is in a good position to realize the interest of knowing all of them.



Fresh water on one side, a brackish lagoon on the other.



Above busy street market in Singapore. Above right: hawkers and vendors — selling all kinds of things for all kinds of people.



More than

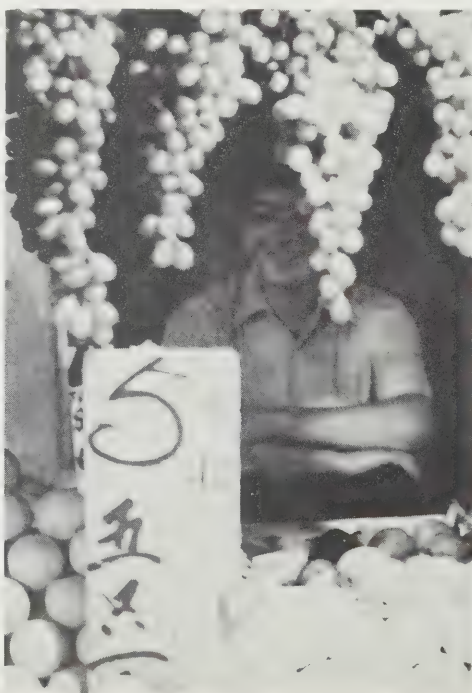
It was nearing the end of a long day for the hawker, a day that had begun before dawn with a five-mile trek to purchase his vegetables, then back into town heavily laden to set up his stall and start selling by 5 a.m. Now, while briskly bargaining with a tight-fisted customer as he counted the change from another sale, he was feeling satisfied at having cleared a good profit that day. But not for long: a passing policeman observed the hawker operating past the prescribed market hours, arrested him, closed down his stall and confiscated his goods.

Not an unusual occurrence in many cities of Asia — except that this particular hawker was in reality a social science professor involved in an IDR-supported study of the lives and livelihoods of hawkers and vendors. In his efforts to find out how hawkers really live, he had got carried away — literally! It is not recorded who was the more embarrassed, the professor or the policeman.

The professor-turned-hawker was a member of one of three teams who began in 1972 a study of street traders in six cities of Indonesia, Malaysia and the Philippines. Why a study of hawkers and vendors? Because they are people who are much more than just a colourful anachronism. They are to be found in almost every major town and city, not only in Asia but around the world.

They sell almost everything from cabbages to candles, from instant food to fortunes. They are a major source (sometimes the only source) of fresh fruit, vegetables and meat for so-

Below: mobile street traders can cause traffic problems . . . but they are also a source of fresh fruit and vegetables for city dwellers.





business... a way of life

...dwellers – especially the poor. They are a colourful tourist attraction, and, so long as they are trading, they are not unemployed.

Yet they also present problems: parking traffic, leaving garbage, neglecting basic hygiene in the preparation of food. It is perhaps because of these contrasts that different cities have adopted different positions on street trading. Some try to drive out hawkers and vendors with strictly enforced bylaws and heavy fines, while others have attempted to raise standards through licensing systems and the creation of orderly markets.

Through interviews with both street vendors and officials in all six cities, the researchers attempted to build up a complete picture – perhaps the first of its kind – of the hawkers and vendors and their role in the life of the city. Now their final report is completed, together with an illustrated booklet and an audio-visual presentation to help disseminate their findings as wide an audience as possible.

In September representatives of the governments of some 30 urban areas in Asia will meet at a conference in Kuala Lumpur to hear the specific recommendations of the research team, and to exchange their own views and experiences on the subject. Under the right conditions, hawkers and vendors can make a useful and colourful contribution to the lifestyle of any city. Hopefully the conference will lead to the adoption of policies which will provide those conditions. The professor's long day in the market will not have been in vain.



Street trading can be regulated through licensing systems, regular inspections to maintain health standards, and providing clean and orderly sites.



During the past two years mankind has become increasingly conscious of the need to conserve the world's dwindling resources of fossilized fuels. Yet, at the same time that we are burning up fuel derived from solar energy produced millions of years ago, most of the energy currently being radiated by the sun is being wasted. Only a very small percentage of this energy is transformed into utilizable plant products. Furthermore, the process of making part of a plant suitable for human diets often involves the discarding of a large volume of material. Two IDRC-supported projects in the animal nutrition field seek to bring about a better utilization of incident solar energy in the coffee and sugar industries.

The coffee plant is a bush which can grow to more than six feet in height. It produces a crop of berries at the heart of which is a seed which, when extracted, dried, roasted and ground produces a product with which we are all familiar. During the process of extraction of the coffee seed from the ripe berries, the pulp surrounding the seed has to be removed. This pulp is sometimes used as a fertilizer or as a soil conditioner but more often is dumped, either into rivers, or into large heaps where it is allowed to decompose. A number of attempts have been made to find a more productive use for this pulp but these have had limited success due primarily to its high moisture content and to its content of certain toxic products.

In recent years there has been some interest in Central America in examining the potential of dried coffee pulp as a livestock feed. The significance of this can be appreciated from the fact that there is a potential for producing between one and one-and-a-half million metric tons of dried coffee pulp every year in Latin America alone. This pulp consists mainly of carbohydrate but also has around 10 percent of good quality protein. Theoretically, it should be possible to use the pulp to replace cereal grains (which are frequently imported in Latin America) as a component of compounded livestock feeds. However, in practice the use of coffee pulp in animal rations causes a reduction in both liveweight gain and milk production.

In order to investigate the reason for this, IDRC approved a project early in 1973 to enable the Nutritional Institute of Central America and Pan-

Waste not, want not

by Barry Nestel



Sugar cane in use as cattle feed on commercial operation in Chetumal.

ama (INCAP) to intensify their work on developing practical and economic rations for livestock based on the use of high levels of coffee pulp.

INCAP is attached to the Panamerican Health Organization and is recognized by the University of Guatemala so that graduate students doing both course work and research at INCAP can obtain M.Sc. degrees from this program. The research on coffee pulp has been carried out partially by students working for higher degrees and partially by INCAP's own scientists led by Dr Ricardo Bressani, the Head of the Institute's Agricultural and Food Science Division.

During the two years of the project work has concentrated on identifying the substances present in coffee pulp that are responsible for its inhibitory effect in animal rations and in developing processing techniques to

reduce or eliminate the toxic substances in order to improve the nutritional value of the pulp.

The researchers have determined that there are at least three groups of substances in the pulp which act as inhibitors of growth. One of these is caffeine, which appears to increase the animals' thirst and subsequently leads to an increased urinary output. With diets high in coffee pulp this reduces protein retention unless supplementary protein is given in the diet. Other growth inhibitors in the pulp are tannins and polyphenols. The exact mechanism of the effects of these compounds is not fully understood but it appears that they also inhibit protein digestibility, so that when rations containing more than 15 to 20 percent of coffee pulp are used they require to be supplemented by expensive protein if weight gains are to be maintained. Since coffee pulp can be collected, dried and marketed at a price equivalent to about a third of that of cereals, it would be an extremely attractive proposition to be able to include it in rations at levels of 40 to 60 percent. However, for this to be done the effects of the toxic elements must first be either reduced or eliminated.

Work done to date has shown that the toxicity can be reduced by aging the pulp, by ensiling it before drying it and by decaffeination through washing. Further work on these techniques is in progress and a follow-up project is under discussion which has the objective of determining the precise significance of the individual toxic substance and of refining the techniques for neutralizing or eliminating them. At the same time it is planned to develop a program at the farm level to assess the economic merits of the technology already developed for using coffee pulp at levels of 15 to 20 percent in the rations of cattle and swine.

Another crop in which much of the plant is discarded during processing is sugar cane. Before harvesting the leaves are stripped off the cane plant and the stem is then milled to extract sugar. The extraction rate is usually such that between 10 and 14 percent of the stem is converted into crystallized sugar. In the milling process molasses is produced as a by-product, as is the residual stem from which the sugar has been extracted and which is known as bagasse. This is often used to fire the furnaces that drive the mill, but in large factory bagasse may

also be converted into fibreboard.

During the past five or six years considerable work has been done in Cuba regarding the use of high levels of molasses in animal rations. Some work has also been supported by the Canadian International Development Agency (CIDA) in Barbados on the use of de-rinded sugar cane in ruminant diets. Whilst both of these processes have had some initial success under controlled conditions, scientific workers in other countries have encountered difficulties in repeating them on a commercial scale. These difficulties appear to be associated with the fact that both sugar cane and molasses ferment very readily, especially under moist conditions, and fermented sugar rapidly causes digestive disturbances in ruminants.

A detailed examination of this situation is under way in a new IDRC-supported project in Mexico where at the present time over 30 million tons of sugar cane are grown annually. Much of this cane is grown by small farmers and milled by small mills which are not always economic unless sugar prices are exceptionally high, as they have been during the past year. In Mexico, as in some other Latin American countries, there is considerable scope for expansion of sugar production for large scale operations but such an expansion could have serious socio-economic implications for small marginal producers located a long way from modern mills. Were sugar cane to be economically utilisable for animal feed there would be a rationale for some diversification within the industry, using sugar cane as a livestock feed in cane producing areas where sugar production was economically marginal. A successful technology in this respect would also have implications for a number of other countries such as some of the smaller Caribbean islands which were once sugar producers but have been forced to close down their small-scale sugar industries, because, although they are capable of producing more energy per acre from sugar than from any other crop, they are unable to process this energy economically in a small sugar factory.

The project in Mexico is coordinated by the National Council for Science and Technology (CONACYT). It is examining the practical implications of sugar cane products in livestock rations and studying the biochemistry of sugar fermentation and the economic implications for both

the sugar and the cattle industries of diverting marginal sugar production from cane factories to ruminant stomachs.

As in the case of the coffee work at INCAP much of the research is being conducted by graduate students: 12 from the National University doing research for their M.Sc.s and two Mexican students registered for Ph.D.s at the Universities of Paris and Aberdeen who are doing their field research in their home country. The Economics Program is directed by Dr Miguel Szekely from the Center for Economic Development at the National University and the fermentation studies by Dr Miguel Viniestra from the Institute of Biomedical Investigations in the Faculty of Medi-



Converting sugar cane to cattle feed with simple grinder developed in Mexico.

cine of the same University. The work directed by these two men provides basic support for the field trials which are being carried out on research stations at Tampico and Chetumal. At Tampico the work is being led by animal scientist Dr Jorge de Alba, and is being carried out on a farm belonging to the Mexican Association of Animal Production that is used as a training centre for recipients of a large Bank of Mexico loan program (partially funded by the World Bank) for livestock development. At Chetumal the research station belongs to the State Government although it also receives some support from the Bank of Mexico. The program on this station is directed by Dr T. R. Preston, one of the world's foremost animal nutritionists.

The senior scientists at both Chetumal and Tampico are recognized

supervisors of the Faculty of Veterinary and Animal Science at the National University where under the leadership of Dean Quiroz a new program has been developed for post-graduate training in animal nutrition as a component of the sugar cane research network.

A sixth organization linked into this program is the National Sugar Commission which controls the sugar industry in Mexico and has its own Animal Nutrition Program (PRONUGA) which sponsors animal nutrition research and extension related to the use of sugar products. The Commission does not have its own research facilities but collaborates closely with the Ministry of Agriculture, which is associated with the project on an informal basis. A similar type of informal collaboration occurs with the Ministry of Irrigation in a large new irrigation project near to Tampico. There the Ministry is evaluating the economics of different cropping and farming systems on an area of nearly 400,000 acres where a new irrigation scheme will come into operation in 1977 and where the role of sugar cane as animal feed is being tested as a component of various proposed farming systems.

Thus the Mexican program involves a unique combination of talents in the fields of economics, biochemistry, agronomy, animal nutrition and animal health. Its preliminary results indicate that the development of efficient cattle feeding systems using high levels of sugar-cane diets — thus increasing small farm incomes by diversifying marginal cane producing areas — is a goal that will not be easy to achieve. However, the team working on this project is a very strong one with a broad based approach and they are convinced that the problem can be solved. As in the case of the coffee pulp research in Guatemala a successful outcome would be of considerable importance in many tropical areas and the project's progress is being followed with considerable interest.

Barry Nestel is an associate director of IDRC's Agriculture, Food and Nutrition Sciences division. He is based in the Centre's regional office in Bogota.

Community health provides the key to rural development



Jeni Páez is 23 years old and has worked as a health promoter in her community for six years. Before, she says, women did not attend prenatal courses; now with their help she is contributing to the saving of lives. Working eight hours a day, often walking long distances, she feels she is known and appreciated by the community. She hopes one day to finish secondary school and take a course as a nursing auxiliary.

Traditionally, the emphasis in plans for rural development has been on productivity and other economic factors, in the belief that the health and welfare of the community will naturally ensue. CIMDER – the Rural Development Research Centre in Colombia – has been working since 1972 on an experimental development program that is attempting to demonstrate that in fact the reverse is true: that community health and welfare in themselves play a fundamental role in rural development.

Concentrating on an area to the north of the town of Cauca with a rural population of about 40,000, the experimental project hopes to achieve two major objectives within a five-year period: to provide primary health services to the entire population, while simultaneously reducing the communities' health problems and improving sanitary facilities. This is seen as spearheading the overall aim of improving the welfare of the community as a whole.

The project itself is supported jointly by the IDRC, the University and Health Section in Cauca, and is administered by the Foundation for Higher Education. Employment generation and food production are being tackled by the Colombian Agriculture and Livestock Institute, whose rural development project in northern Cauca coincides territorially with the CIMDER health project.

The link between the people of the community and the professional health services available in the municipal health centres and regional hospitals, is the volunteer health worker. These are mostly young women from the community who, for a minimal



monthly allowance (about \$7.50) undertake to spend at least four hours each day working for the health service.

They receive eight weeks training which enables them to provide first-aid, pre-natal care, perform normal deliveries, give injections and vaccinations and make preliminary diagnoses. Equally important, however, is their role as promoters of health education, and in orienting the community at large to the use of the health centres and hospitals for professional services.

Also important are the traditional elements — village midwives, healers, herbalists, dentists and the like. Whenever possible they are re-trained and incorporated into the system. In the pilot area — encompassing about 20 percent of the population — where the project has already begun, every traditional midwife was interviewed by the CIMDER team. In spite of such varying factors as age and literacy, this group showed great interest in self-improvement through a course.

A great deal of detailed planning and preparation were necessary before the project even began. The cartography and zoning were studied in order to predict the flow of people to existing health centres and to determine the size and location of new facilities in the area. Surveys of hundreds of homes in the pilot area provided essential demographic, socio-economic, health and sanitation data for subsequent evaluation of the program's effectiveness.

Surveys now under way will provide information on the availability of resources, both physical and human, and seek the opinions of community leaders, with a view to



forming family health unions.

At the request of the community, the project health group is also developing instruction programs which are given through night courses in the rural schools. This opens up communication with the community and cooperation with its leaders, and has been underway for a year in the pilot area. The courses are for adults — that is those who are out of the formal education system — and, at their suggestion, include, in addition to first-aid, such subjects as community organization, cooperativism and human relations (which they describe as the ability to express themselves and communicate with others). This part of the health service is carried out jointly with CIMDER's informal education program.

And that is the essence of the CIMDER program: the integrated approach which makes it both multidisciplinary and inter-institutional. Its technical committee brings together representatives of five institutions as well as a variety of disciplines, besides the municipalities involved. At the community level the program works with local organizations such as cooperatives, farmers' associations and private enterprise.

By actively involving as many local resources as possible it is hoped to guarantee the continuation of the program beyond the experimental five-year period, and that, in addition to improved health, such a communal organization will lead to an improvement in all the other aspects of community life.

SUSANA AMAYA

Above left: patient receives emergency attention at neighbourhood clinic. Above: night courses are being developed at the request of the community.



More than half the dwellings in the pilot area lack sanitary services — water comes from wells like this one.

REGIONAL NEWS

Bogota

The month of July at the Latin American Regional Office was highlighted by the visits of Dr Misael Pastrana Borrero, former President of Colombia and of Dr W. David Hopper, IDRC President.

The President of Colombia during 1970-1974, Dr Pastrana had invited IDRC to establish its regional office for Latin America in Bogota. The agreement to do so was signed during his presidential term in August, 1972. Greatly interested in IDRC, he was also instrumental in the signing of the general technical and scientific cooperation agreement between Colombia and IDRC for projects conducted in this country.

As shown by his recent visit to the Regional Office, Dr Pastrana's interest in IDRC and in IDRC-supported programs has by no means diminished. A roundtable discussion conducted by LARO's international program representatives focussed on agricultural productivity and rural development, two topics of particular interest to the leader of Colombia's conservative party. Copies of IDRC publications were presented to Dr Pastrana during a small reception.

Dr. Hopper's visit to Bogota was also an occasion for discussions and information exchange. Accompanied by his senior advisor, Mr Gordon E. Cox, Canada's Chargé d'Affaires in Colombia, Mr R. Cumming and by LARO Director, Mr Henrique Tono, Dr Hopper met with both the President of Colombia, Alphonso Lopez Michelsen and the Minister of External Affairs, Indalecio Liévano Aguirre at the San Carlos Presidential Palace.



Photo: Jaime Rojas

Dr Pastrana (nearest camera) meets with senior LARO staff.

Following an informal lunch at the Regional Office, Dr Hopper reviewed current IDRC programs and activities with LARO professional staff. He also witnessed the recent growth of the LARO offices and personnel. Since his previous visit to Bogota to attend the Board of Governor's Meeting in March 1973, the offices have expanded from the half-floor they occupied in the building on Calle 72, to occupy the entire fourth floor. Additional space on the first level houses the publications and public information offices. Keeping pace with the increasing activities, LARO's professional and support staff now numbers 23.

STELLA FEFERBAUM

Singapore

The Southeast Asia Population Research Awards Program (SEAPRAP), which is jointly funded by IDRC and the Ford Foundation and is administered by the Asia Regional Office, is now in its second year of operation.

The program's aim is to develop the research skills of young and relatively inexperienced social scientists in the region. It operates on the premise that the best way to develop these skills is to provide them with the opportunity to both formulate research proposals and to carry them out. It is an effective strategy, and the benefits are two-fold. First, these young social scientists are expected eventually to augment the pool of trained researchers in the region, as well as the knowledge of population problems in their own countries. Second, it is anticipated that the research results will be useful in population planning and policy-making at the national levels.

Response to the program so far has been very encouraging. A total of 96 applications was received for two

rounds of awards made during the first year. These were considered by a committee of senior scholars from the region, who recommended a total of 22 awards to support research projects in various social science aspects of population research.

By country, Indonesia and the Philippines each received six awards, Thailand five, Malaysia three, and Singapore and Vietnam one each. A follow-up by the project coordinator of this first batch of awardees indicates encouraging progress towards the successful completion of projects.

After considering applications for the third round of awards in September, the committee will review the activities of the program to date and draw up guidelines for its future direction. The SEAPRAP program committee consists of Dr K. Sandhu (Chairman) from Singapore; Dr R. Bulatao, Philippines; Dr N. Iskander, Indonesia; Prof. A. Namatra, Thailand; and Dr Yip Yat Hoong, Malaysia.

PEDRO V. FLORES
Project coordinator

Reports from the Centre's regional offices in Africa, Asia, Latin America and the Middle East

Beirut

As is well known, the situation in Beirut during recent months has been rather unsettled, to say the least. Sporadic gunfire and, at times, continual street battles lasting for days, cut down Regional Office activities during May, June, and July.

Office staff were able to be on duty for short periods during this time but visitors were discouraged from trying to enter Lebanon for long stretches. Work on the ICARDA program was maintained, though somewhat slowed down, and program personnel in the office generally managed to continue their travels and activities. The only contact with the outside was often only by telex.

All the families of Centre Staff at the office were forced to leave Beirut in June. Now that the tension has eased somewhat, they are returning. John Comeau and Claude-

Paul Boivin, who visited recently, report that the city is getting back to normal, though the tension can be felt.

Salah Dessouki, the Regional Director, has formulated an emergency evacuation plan in which details of steps to be taken by all the staff in the event of a further deterioration of the situation are outlined. The plan calls for evacuation to Cairo, where arrangements have been made for immediate accommodation for everyone, if required.

Inder Bhoi, Senior Legal Officer in the Office of the Secretary, spent 12 long days at the end of June and into July, confined to the Holiday Inn. He arrived in Beirut on June 26 just before heavy fighting began and his only communication with the outside was by the occasional telex he managed to get out. There seemed to be no great danger, as long as one didn't venture outside, though at one point, a movie theatre in the same building was destroyed by a bomb. Under says he made many new friends during his siege and the only discouraging word was that the barman appeared to be running out of Scotch towards the end.

JOHN LAIDLAW

Dakar

During the last quarter the new director of the West Africa Regional Office in Dakar, Stanislas Adotevi, took up his duties. He replaces Anthony Price who is now in Nairobi, Kenya, preparing for the opening of the new IDRC regional office for East Africa, of which he will be the first director.

A native of Dahomey, Mr Adotevi is an alumnus of the Ecole Normale Supérieure de France. A doctor of anthropology and professor of philosophy, he had originally planned on an academic career. He was, however, soon called to the service of his country, and from 1964 to 1970 served as Secretary General of the Government and as Minister of Information, Youth and Sports. Resuming his academic career in 1970, Mr Adotevi was professor of anthropology, ethnology and religious sciences

at the University of Paris at the time of his appointment to the IDRC.

As director of the regional office for West Africa, Mr Adotevi has set himself the objectives of "improving the visibility of the IDRC in Africa" and maintaining closer relations with the governments and heads of African states. The staff of the regional office now numbers 15, of whom four are program officers.

The holiday season brought back to Canada Jean Steckle, Hubert Leblanc and Jean de Chantal. Ms Steckle took advantage of her visit to head office to prepare the publication of her new book on cowpeas. The book contains new recipes adapted to West African methods of preparation and cooking together with information on the nutritive value, processing and conservation of cowpeas. To be published by the Centre later this year, this unique book will be entitled 'Cowpeas: cooking and processing in West Africa'. A French edition adapted to the ways and customs of Francophone West African countries is also in preparation.

BRIEFS

Water: a major international effort

There is a grim irony in the fact that, although two-thirds of our planet's surface is covered by oceans, tens of millions of its inhabitants do not have an adequate supply of fresh water.

Water, both to drink and to provide proper sanitation services, is essential to the health and well-being of any community. Lack of good water supply, especially in the rural and urban fringe areas of the developing countries, is one of the major causes of disease. In some countries it has been identified as the leading cause of death—with children under the age of five being the main sufferers. And as the world's population grows, so does the extent of the problem.

Now a major international effort is growing in an attempt to both promote and assist the improvement of water supply and sanitation in the rural areas and squatter settlements of the developing world. Following a study of research priorities by the IDRC, a working group of international agencies was formed

last year, consisting of representatives of WHO, UNDP, IBRD, UNICEF, UNEP, OECD and IDRC.

After studying both the technical problems to be overcome and the institutional arrangements that might be needed for an expanded international effort to tackle the problem, the group came to several conclusions. First, there is often a lack of appreciation at all levels—from government through to the home—of the benefits to be realized from water supply and sanitation programs. One priority, then, is education to bring about changes in attitudes. Another crucial requirement is for training to provide the skilled and semi-skilled manpower needed to plan, install, operate and maintain basic sanitary services. Equally there is a need for technological research and information dissemination—both to ensure that existing technologies are improved in the light of new scientific knowledge, and that information about the latest techniques is available where it is needed.



The group recommended establishing a network of international, national and regional centres to promote and assist such programs, and has invited the participation of national governments in forming an enlarged working group to co-ordinate an all-out international effort. In the meantime, the IDRC, through its Information Sciences division has already

published a bibliography on the subject and is preparing an outline plan for an international information system, while the Population and Health Sciences division has appointed a specialist in rural water supply and sanitation specifically to work in support of developing country research programs in this sector.

Rice post-harvest technology studied

The weakest links in the food production chain are often those leading from the farmer's field to the kitchen table. Food processing and distribution is a complex, and sometimes wasteful business—in Asia for example it has been estimated that losses on the rice harvest may run as high as 30 to 35 percent.

And it is in Asia that recognition of the seriousness of the problem has led to the rapid evolution of a cooperative research network in rice post-harvest technology. A working group of Asian food scientists and technologists met twice in 1972. After rating rice as top priority they agreed upon action programs and research priorities,

and recommended strategies for their implementation.

As a first step, a directory of food science research activities was published, setting out the scope of current work in the field. The directory will be up-dated every two years. Work was begun on structuring and implementation of short courses, and two training workshops have already been held. Scholarships are to be provided too, for engineers and managers. Following a meeting of senior administrators and scientists from rice institutions and government bodies in 1973, a survey of the state of rice post-harvest technology was commissioned by IDRC to obtain data on which to base research

emphasis. In 1974 senior scientists met again, under the joint sponsorship of IDRC and the International Rice Research Institute, to define the role of international and regional centres in solving post-harvest problems.

So where are we at now? The Centre has received requests for support from Indonesia, Thailand, Singapore and the Philippines, and several others are in the pipeline. Work on some projects has already begun. IRRI has also submitted a program proposal. There is great scope for program development in rice post-harvest research, and there is a consensus that a centralized effort is imperative.

The Centre now has a unique opportunity to make a proposal that embodies the recommendations made by the Technical Advisory Committee of the Consultative Group on International Agricultural Research for more effective coordination among donor agencies. It is hoped that such an IDRC-supported network in Southeast Asia can serve as a model reflecting the expressed needs of the region, and demonstrating the viability of a system of coordination proposed and implemented entirely by the people of Asia, with the donor agencies' support.

E. V. ARAULLO

There's much more than wood in the forest

For more than 30 years John Bene was a leading figure in the Canadian forest products industry. A qualified engineer with a flair for business, he readily admits that he made a handsome profit during his years in the industry. Then one day he quit.

"Most of my friends and business acquaintances thought I was either sick or in financial trouble," he says. But they were wrong. John Bene had simply lost his profit motivation. "In our industrial society almost anything goes so long as it's legal and makes money," he says ruefully. "We don't produce what people need—we just produce things then we make people want them. It's terribly wasteful."

The challenge came when Bene met Maurice Strong, another successful self-made businessman. Strong, now head of the UN Environment Program, was then President of CIDA. He convinced Bene that there was a need for people like him in the field of international development. Before too long John Bene was Director General of the Special Advisors Branch at CIDA, and a member of the founding Board of Governors of the IDRC.

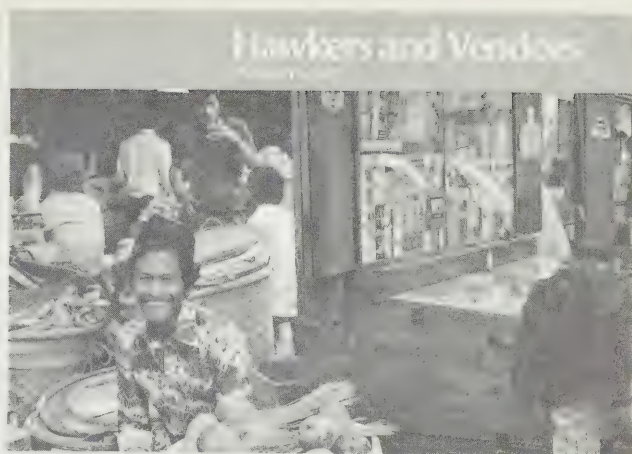
Now, at an age when most men are looking forward to a restful retirement, he has taken on a new challenge. As special advisor to IDRC President David Hopper, he will carry out a 12-month survey of the state of forestry research and training at the international level, and make recommendations for the more effective use of limited resources, perhaps leading to the establishment of international forestry research institutes or problem-oriented networks of existing research facilities.

Mr. Bene is enthusiastic about his new assignment, pointing out that there is an enormous potential for increased social and economic benefit from the forest. "The world has about 700-million hectares of what is known as humid tropical forest," he says. "In a natural state they produce about one cubic meter per hectare of marketable wood per year. That yield could be increased 30 times, and much food could be grown between the young trees."

But he is concerned too about the ruthless exploitation of forests which has resulted in some 1,200-million hectares of semi-desert where once there were trees. Reforestation could return that land to its original state, he says, and make it available for food production as well as forestry. Trees protect the land from too much sunlight, help retain moisture and build up the land with their residues.

Then there are other forest by-products such as fruit, nuts, rubber, resins used in making glue and chicle for chewing gum. The forest floor could even provide an excellent breeding ground for giant protein-rich edible snails. Many institutions, including the IDRC, are already conducting research into various aspects of forestry. John Bene feels that maybe an international network of forestry research centres is what is needed to bring it all together.

"After all," he says, "the International Rice Research Institute's \$8-million annual budget has resulted in a \$3-billion annual increase in the world's rice crop." And that, by anyone's standards, is cost-effective.



HAWKERS AND VENDORS IN ASIAN CITIES, published by the IDRC, August 1975, 24 pages (IDRC 044e). Reviewed by Dr Suteera Thomson. Now living in Canada, Dr Thomson was formerly with the Science Faculty of Mahidol University, Thailand (where, in addition to teaching, she established the university's first cooperative store and credit union), and is deeply concerned with the role of women in Southeast Asia.

"Hawkers and Vendors" is a report based on an IDRC-supported study of street traders in six different metropolitan areas—Manila, Baguio, Jakarta, Bandung, Kuala Lumpur and Malacca—ranging in population from 100,000 to 4 million.

Many individual hawkers were interviewed during the course of the study, and the booklet provides glimpses of their daily lives. A picture emerges of the typical hawker: his background and education; what he sells and to whom; the problems he faces and the problems he creates.

The report also describes measures taken by each city to help the hawkers. Some cities are beginning to look at hawking as a trade, not the last resort for earning a living. The skills of some young hawkers are being increased through courses in accounting, hygiene and marketing. To help the hawkers with health and sanitation, some city governments have built location units with piped-in water, permanent flooring and a place for the garbage. Some hawkers are screened for tuberculosis and other communicable diseases. Some cities close off certain streets for a few hours at night to provide a space for hawkers to do their business. Even in some office buildings or factories, hawkers are provided space for plying their trade. Credit in terms of interest-free or long-term loans, is available in some cities, encouraging them to take up a profession, or to help the established hawkers seeking to improve their business.

The report is a good introduction to the subject, with beautiful illustrations of the hawkers and the goods they sell. It will be especially useful for a general readership interested in a short general survey, and the preface makes it clear that this is the main purpose of the booklet. Even allowing for this, however, there are some very simple questions left unanswered . . . such as the difference between hawkers and vendors.

Nor does the report attempt to analyse the study's findings. Why, for instance, do there appear to be significantly more women than men hawkers in the Philippines, while in the other cities the reverse is true? Or why is the ratio of hawkers to the rest of the population five to eight times higher in Manila than in the other cities surveyed? This booklet offers little, then, to people who are interested in cross-cultural or cross-city comparisons.

Despite such limitations, which are no doubt to some extent inevitable in a publication of this type, this booklet provides an excellent overview of one of the more fascinating, and at the same time disadvantaged groups of people found in Asia today.

For many years, there have been small numbers of advocates of certain "low level" technologies as being particularly appropriate for use in the less industrialized countries of the world. Meanwhile in the highly industrialized countries, a pattern of development has evolved based on the innovations of modern "high technology" supported by the cost-benefit analyses of modern economics. Application of this approach has generally been considered by most development experts to be the best solution to the problems of poorer countries if only these countries possessed the proper infrastructure.

But a growing series of crises in the industrialized countries — energy shortages, economic stagnation, environmental degradation, urban decay, increasing crime — seriously calls into question the appropriateness for rich or poor countries of a technology that is based on manipulation of poorly understood ecological and social systems and an economic analysis that exaggerates or invents economic benefits, while discounting or ignoring environmental or social costs.

As a result of these crises there is a reawakening of interest in the possibilities of adapting some of those nearly-forgotten "low level" technologies for use not just in poor countries but in the highly industrialized countries as well.

This is particularly true in the case of energy consumption, where much of modern technology is based on an extravagant and wasteful use of non-renewable resources. Now that the era of cheap and plentiful oil is rapidly drawing to a close and concern is mounting about the grave dangers of a headlong rush to nuclear energy, there is growing interest in obtaining renewable, non-polluting energy from sources such as the sun, the wind, and wastes.

This interest was very much in evidence at the first annual meeting of the Solar Energy Society of Canada, held in Ottawa in June. The conference was attended by nearly 400 people, including architects, engineers, government officials, officials from power companies and manufacturing industries, academics, and other interested or concerned individuals, some of whom have already built solar heated houses.

While not all forms of solar technology are necessarily simple or unsophisticated — something that became clear from some of the very

Commentary

Tilting at windmills?

by Dennis Schroeder

complex schemes described during the conference — it was also clear that economically and technically viable energy-getting systems have long existed but have been virtually ignored as long as petroleum has been predominant as an energy source. Commented one high federal government official, "Solar and wind energy are so obvious that people feel there must be something wrong with them."

Much of the discussion dealt, not surprisingly, with solar and other renewable sources of energy as they relate to present and future Canadian needs. But numerous references were also made to the Third World, giving one the impression that there is a growing awareness among Canadians that solutions to world problems such as energy and food shortages, overpopulation, overconsumption, pollution and waste, must apply equally everywhere: certain privileged societies can no longer hoard their riches and large sectors of humanity can no longer be discriminated against blatantly. For example, one speaker pointed out that, at present levels of energy consumption, a North American baby will grow up to be 500 times as expensive as an Indian baby.

While there is no indication that a major shift to solar and other related energy forms is imminent, the implications of such a shift reach far beyond a simple change in technologies. These forms of energy are available everywhere and their most efficient use in terms of energy costs is probably on a comparatively small scale at the local level, thus avoiding the high cost of long distance transmission. This could result in significant alterations in the lifestyle that accompanies present patterns of energy consumption. For example, there would likely be a greater decen-

tralization in the control and use of energy, and less highly concentrated forms of human settlement might become more common. Moreover, solar energy technology, not lending itself particularly well to mass production techniques, is less likely than other forms of energy production to fall into the control of a few large multinational corporations. Thus, there could be a far greater degree of local self-sufficiency in supplying basic needs of people.

This has in fact long been the case in many parts of the Third World; now the task of developing and implementing environmentally appropriate technologies and lifestyles must be shared by societies at all levels of technological sophistication. Knowledge and wisdom accumulated during centuries of 'trial-and-error' experimentation, as well as the deductive methods of modern science, all must be used in this process.

Nowhere is the need for a change in our attitudes toward nature as reflected in our technologies more obvious than in agriculture, one of the most important of human activities and our principal link to the ecosystem. In many industrialized countries, there have been remarkable increases in agricultural productivity during the twentieth century, but they have been accompanied by hidden costs that are only now becoming more apparent. Agriculture has become increasingly energy-intensive and has caused extensive environmental disruption as it has come to be regarded as a commercial industry and inappropriate industrial methods have been applied to it.

New and more powerful machinery has been developed and farms have been enlarged and redesigned to accommodate the changes. This has facilitated the development of monoculture — the raising of single crops in the interests of economies of scale — covering whole regions. Another development has been hybridization, no longer primarily for disease resistance or nutritional value, but for high yields and, in the case of fruit and vegetables, for appearance and ability to withstand long-distance transportation. One result has been a decline in the size of plant gene pools which, together with the practice of monoculture, has made plants more vulnerable to predators. This has been compensated for by heavy usage of chemical pesticides, insecticides, herbicides, and fungicides, while greatly



ally-supportive ecological system. This does not imply a return to some nonexistent golden age of the past. Much valuable knowledge has been accumulated that did not exist in the past; it is a faulty perception of our relationship to nature that has led to its misapplication. The newly-evolving communities, whether they are in currently rich or poor countries, could continue the process of research and exchange of information, in effect decentralizing these functions as well and involving more non-'experts' in them.

One of the most promising approaches in this area is ecosystem farming: the development of artificial systems that imitate those found in nature. A number of small groups in North America and Europe have been attempting to develop ecosystem farms. One such group is the New Alchemy Institute in the United States. It has been successful in integrating vegetable gardens, worms, insects, bees, fish, animals and humans into a small self-sustaining system. It is also planning to develop a complex known as the "Ark," consisting of greenhouse, aquaculture, and other living components powered by the sun and the wind, in Prince Edward Island. Many of these small groups have been inspired by the polyculture economies that have long existed in Third World countries. For example, in Southeast Asia, there are polyculture farms that integrate vegetables, fish, and livestock into one system.

There are many other examples of agricultural research that could be mentioned and there are other areas—such as transportation—where much more research into the use of renewable energy sources and environmentally appropriate technology is needed. But the important point is that nature is composed of complex, interrelated systems, and scientific research must help us to understand those systems and relationships more clearly. Our technology, must be redirected to organize our productive activities and restructure our lifestyles so they are in harmony with those systems. In this respect, no societies are fully "developed" or "underdeveloped"; we are all in the process of developing human systems that are either moving closer to or farther away from a symbiotic relationship with other life systems in nature.

Dennis Schroeder is an editorial assistant with IDRC's publications division.

increased applications of synthetic fertilizers have been needed to maintain high yields. This, in turn, has led to problems of soil leaching and pollution of ground water. Examples of high energy costs and environmental damage can also be seen in other modern agricultural practices such as livestock feeding and raising techniques.

Traditional agriculture in less industrialized countries has generally been much more energy-efficient. While Canadian agriculture now uses an average of five BTUs of fossil fuel energy to produce one BTU of food energy (nearly a five-fold increase since 1910), Chinese wet rice agriculture produces about 53 BTUs of food energy for each BTU of human energy input. Unfortunately, inappropriate industrial agricultural technology has been transferred to many tropical regions and resulted in more severe problems of social dislocation and ecological damage than have taken place in temperate zones, and food shortages have not been over-

come. It does not necessarily follow, of course, that traditional agricultural methods are superior. For example, overcultivation and overgrazing have led to a depletion of soil nutrients and to erosion and the spread of deserts in some areas.

Thus, in countries such as Canada, there is a need to revive a number of agricultural practices that have been largely phased out, such as the use of animal manure, the decentralization of feedlot operations, a switch from monoculture to mixed farming, crop rotation, and the growing of nitrogen fixing crops.

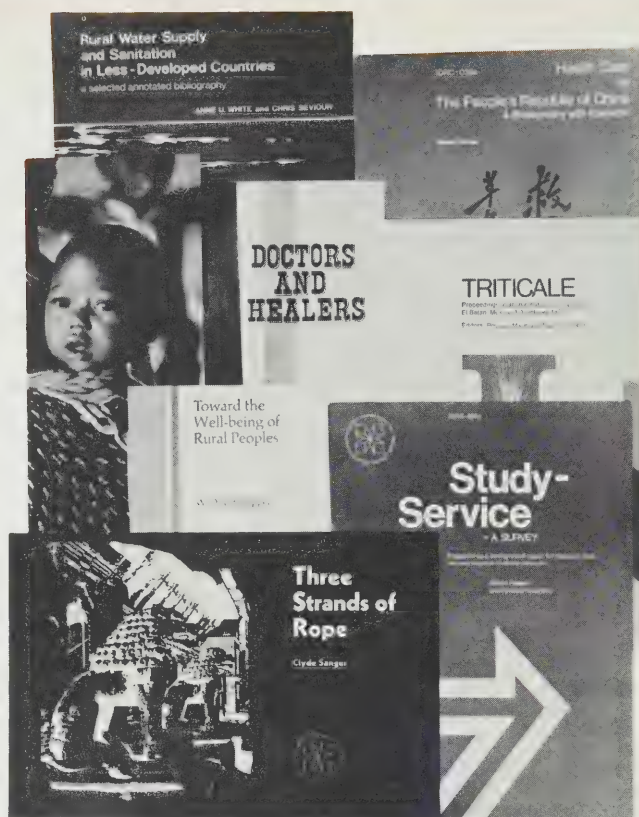
Beyond this, however, signs of a new development option are emerging. As an alternative to increasingly centralized social and economic systems addicted to growth for its own sake and relying on technological advances that require people's lifestyles to be adjusted to them rather than vice versa, there is a possibility of evolving smaller, less centralized, more self-sufficient communities that exist as part of an integrated, mutu-



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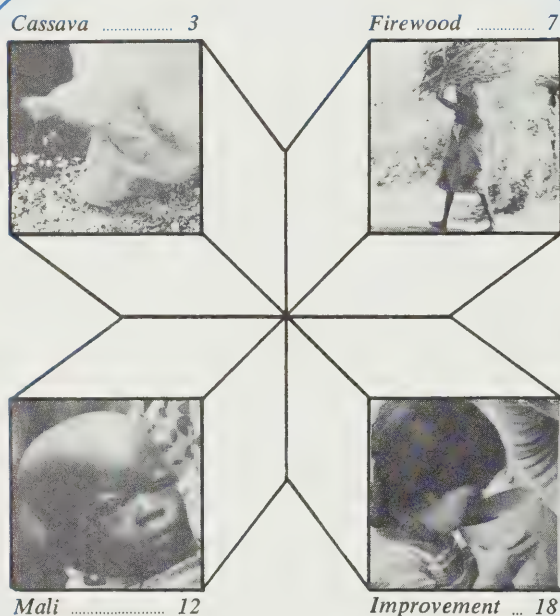
**CASSAVA RESEARCH
GETTING RESULTS**

The IDRC

Reports

VOLUME 4 NUMBER 4

December 1975



CONTENTS

Cassava — the potential is enormous

David Spurgeon reviews global research on cassava. Susana Amaya reports on Colombia's cassava information centre 3

Focus on Africa

Clyde Sanger reports on Africa's growing firewood shortage, and visits IDRC's new regional office in Nairobi. Bob Stanley examines a land tenure project in Senegal and a unique family planning program in Mali. Alexander Dorozynski reviews the global effort to combat tropical diseases in Africa 7

Briefs

People, projects, events 16

Development begins at home

Report on the evolution of a home management project in Colombia 18

Getting young scientists involved

Three participants in the Southeast Asia Population Research Awards Program talk about their experiences 20

The staggering statistics of housing

Michelle Hibler reports on the problems of finding homes for Asia's increasingly urban population 22

New publications

On family planning, health, cassava, rural development, oyster culture, irrigation, and science and technology 23

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CASSAVA: the potential is enormous

Cassava — also known as manioc and tapioca — was until recently one of the world's neglected food crops. DAVID SPURGEON, director of the IDRC's Publications Division, reviews recent research efforts that are attempting to develop the full potential of this versatile tropical root crop, efforts that could triple the present yield.

Four years of work and some \$4 million worth of support from the IDRC and the Canadian International Development Agency have produced some remarkable results from a research program on cassava, the staple diet of some 200 to 300 million people throughout the world.

As those involved in the program prepare to carry it into its second phase, they are planning to disseminate these results and to test and adapt their newly-developed techniques of production and utilization in as many cassava-producing countries as possible.

The achievements include:

- Identification of varieties that yield 45 tons per hectare in Colombian farmers' fields — more than four times the national average yield of 10 tons per hectare.
- Control of bacterial blight and identification of resistance to many important diseases.
- Identification of varieties resistant to many of the major insects.
- Introduction of biological control of important pests.
- Development of methods of rapid propagation.
- Development of tissue-culture techniques by which to produce disease-free material.
- Improved methods of storage.

Cassava is a tropical root plant that originated in the Western hemisphere and is thought to have been first cultivated agriculturally either in Northeast Brazil or along the Colombian-Venezuelan coast. There it appears to

have been the first staple food crop in settled agriculture in the Western hemisphere.

Because it grows only in tropical and sub-tropical areas and is highly perishable, cassava has received little attention from agricultural research workers. In fact, prior to 1971, the total annual global expenditure for research on cassava appears to have been no more than about \$200,000, and few scientists could be found who had studied the crop.

Nevertheless, cassava has enormous potential. Under experimental conditions, it appears to be capable of producing more energy per land unit per year than any other known staple food crop. The highest recorded yield of cassava provides more than 20 percent more calories per hectare than the highest recorded yield of maize, which is generally considered the highest yielding cereal.

Besides its value as a food crop for humans (which is limited by the fact that its protein level is low), cassava has long been exported for its starch content, which possesses characteristics of special interest to the food, paper and chemical industries. In recent years there has also been a new interest in cassava because the dried and pelleted root can be used successfully in animal rations, with an energy value almost identical to that of corn: in the last decade, imports by the European Economic Community have more than tripled, largely for this reason.

Cassava is produced in more than

80 countries, but two-thirds of world production takes place in only five — Brazil, Indonesia, Zaire, Nigeria and India. It is generally grown as a subsistence crop, and is valued because of its tolerance to drought, its ability to grow in poor soils, and its resistance to weeds and insects. It can be planted and harvested in any season and can be left for long periods in the ground without harvesting, which makes it useful as security against famine. In 1974, the value of cassava exports exceeded \$200 million, and a study published by the IDRC (IDRC Monograph 020e, *Cassava utilization and potential markets*, by Truman P. Phillips), indicates that by 1980 the value of these exports is expected to increase to possibly \$500 million annually.

The IDRC's cassava research program began almost as soon as the Centre got underway. At this time, CIDA began discussions to support a cassava program (along with a related swine nutrition program) at the International Centre for Tropical Agriculture (CIAT) in Colombia. At the same time, CIDA requested the Centre to manage both the funds that it proposed allocating to CIAT over a five-year period, and funds it planned to designate for related basic research in Canadian institutions. In September, 1971, a series of contracts were signed between CIDA, CIAT and the IDRC.

The IDRC's approach to the program was, first, to establish a dialogue between CIAT and selected Canadian

institutions, and second, to try to find scientists who either were working on, or had worked on, cassava, in order to obtain their help. The Centre found that few scientists of high calibre had ever worked with cassava, and most of the prominent ones were either retired or no longer active in the field. Nevertheless, enough were found (about two dozen) to hold a workshop at CIAT, review the state of the art in the various specialties, relate this to the draft program, and set up an advisory committee to assist IDRC in managing the program.

Since then, six more workshops have been held on various aspects of cassava in different parts of the world: one each on Common Cassava Mosaic in Nigeria in 1972; on Chronic Cassava Toxicity in London in 1973; on Global Market Prospects for Cassava in Ottawa in 1973; on Processing and Storage Problems in Thailand in 1974; and on the Development of a Standard International Testing Program at CIAT in 1975; and on a Standard International Testing Program, also in 1975 (each of which resulted in a publication).

A complex network of relationships has grown up between a wide range of research organizations throughout the world as a result of the cassava program, and the total effort is a collaborative one. The IDRC has played a major role in catalyzing these efforts. The whole program is interdisciplinary.

Some of the most important work carried out so far has involved classification of the characteristics of the germ plasm collection CIAT had gathered before the program began. Researchers have found a wide range of interesting and valuable characteristics among the 2,300 varieties. Some varieties have shown considerable disease and pest resistance. A good deal of variation exists in root yield between varieties, and this has been related to the form of the canopy of leaves in different plants.

The researchers have identified some 20 to 30 key characteristics exist in the germ plasm collection, and they will endeavor ultimately to bring them all together into a single "superplant" model variety, or ideotype.

Along with such work, studies have been carried out on physiological and agronomic characteristics, such as the optimum plant leaf density, best fertilizer application and harvesting time. One survey, carried out on 300 small farms in five different zones of Colombia, has shown some of the reasons why farm yields currently are so low. Feedback from this farm study and others in Nigeria, Brazil and Thailand will be used to orient future research activities.

Present indications are that while



Scientists at CIAT in Colombia are attempting to develop cassava varieties that are resistant to bacterial blight.

farmers' yields usually lie between 10 and 12 tons per hectare in Colombia, commercial scale yields of more than 40 tons per hectare have been achieved experimentally, and small plot results have gone as high as 66 tons per hectare per year.

Some success has been achieved during the past two years in a project to produce plants free from symptoms of cassava mosaic, using tissue culture techniques. An important part of the work, carried out at the National Research Council of Canada's Prairie Regional Laboratory in Saskatoon, was the identification of an appropriate mixture of three hormones to initiate development of roots and shoots. The technique may provide a means of "cleaning up" diseased stock in order to move desirable germ plasm about freely on an international basis, or for commercial distribution. It may also provide a tool for cassava researchers to produce disease-free stock for research purposes, especially in areas where virus disease is widespread.

The technique offers considerable promise if symptom-free plants can be shown to be disease-free plants, but pending identification of the cause of mosaic this cannot be stated with any degree of certainty.

In 1972, a program was begun at CIAT to identify the important diseases of cassava and the losses they cause, and to develop methods of control. When the program began, there was little reliable information available on cassava diseases, except for cassava mosaic disease. In fact, it was generally believed that these diseases were of no great importance.



The horn worm is one of the major pests that attacks cassava.



Cassava also has potential as a low cost source of animal feed.

But about that time, a major outbreak of cassava bacterial blight (CBB) occurred, dispelling this notion once and for all. As a result of work done in the research program, adequate methods for elimination of this disease were developed, and the CIAT farm itself is now completely free of CBB. Techniques were also developed for screening plant types for resistance to CBB, and several resistant varieties have been identified. Varieties resistant to a number of other diseases have also been identified.

Also successful was the work on parasites of cassava. So successful was it with two varieties—the horn worm and the shoot fly—that work on the CIAT farm has become restricted because of a scarcity of the pests. Interestingly, the situation apparently developed when CIAT stopped using insecticides against the parasites, thus allowing their natural predators to return and attack them. By contrast, continued spraying on a neighboring experimental farm appears to have eliminated the natural predators, resulting in a higher incidence of the pests, particularly the horn worm.

A project at the University of Guelph has succeeded on the laboratory scale in developing a low-cost, low-technology system for production of microbial protein from cassava, for use in an animal feed at prices competitive with ordinary feeds currently used. Cooked cassava roots are inoculated with a fungus, which then grows on the cassava and forms protein. This protein then enriches the cassava mash to produce a feed for animals. The original protein content of cassava is only about one percent on a dry weight basis. The Guelph project has produced a product with 10 percent protein.

An additional advantage of the process is that the microorganism grows well at tropical temperatures. Consequently, unlike many similar proposed processes that rely on organisms that thrive only under temperate conditions, this process does not require costly mechanical refrigeration. Field trials with the fermentor required for the process will soon be carried out in Colombia.

Training programs have not been neglected in the cassava program. For example one enabled a Sri Lankan horticulturist to visit CIAT. Another trained 20 Brazilians during four weeks at CIAT. Some of the participants in the latter course will be concerned with development of a national cassava research program in their own country. Several other Latin American countries have also been involved in plans for a regional network of cassava research. Discussions have begun with India, Ma-



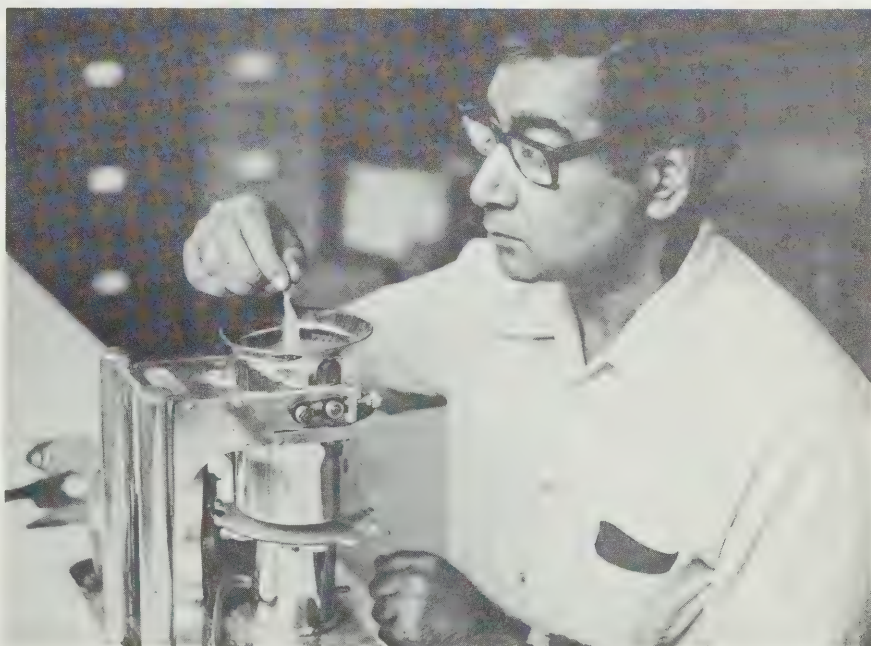
Thai women spreading cassava chips to dry in the sun.

aysia, the Philippines and Brazil to assist these countries in establishing strong national programs; programs concentrating on cassava in animal feed began in Thailand and Nigeria early in 1975, and a project in India has been approved.

A program to breed improved cassava varieties and carry out farm trials, established by the Malaysian Agricultural Research and Development Institute in March, 1975, will also provide training facilities for scientists and technicians from Malaysia and neighboring countries.

The intention for the next phase of the cassava program is to establish cooperative research, demonstration and training programs in two continents: Latin America and Asia. Personnel from CIAT and IDRC will act as research coordinators, and the improved plant materials and agronomic systems will find their way back to CIAT, where information will become available to interested people throughout the world through a Cassava Documentation Centre that has been set up with the help of the Centre's Information Sciences Division. The Documentation Centre is attempting to put together in a single bibliography all the known scientific literature on this valuable crop.

The IDRC will be publishing in early 1976 a comprehensive review entitled "Cassava: the development of an international research network," by Barry Nestel and James Cock (IDRC-059e). The manuscript of this yet unpublished book was used freely as a source document in the preparation of the above article.



Trinidad: scientist removes cassava mites from leaves for examination—the mites are a major insect pest.

Cassava information centre

*Susana Amaya reports from
Colombia on the building of a
unique collection of data*



Photo: CIAT

CIAT, the International Centre for Tropical Agriculture in Palmira, Colombia, was created in 1967 as part of what is now a global network of nine international centres promoting the development of agriculture and livestock raising.

An important aspect of CIAT's operations has always been its library services, and from the beginning the Centre's librarian, Fernando Monge, was concerned that the documentation collected should not become "a mere collection to be consulted by experts." So he hit upon the idea of expanding the library's services through use of a "peek-a-boo" punch card system. This is a relatively simple and inexpensive system in which a subject is broken down into keywords, a card is punched for each, and this then provides an instant visual indication of specific references available when placed over a punched master card on a backlighted screen.

At the same time as Monge was developing his information system, a research program on cassava was being developed (one of six programs in which CIAT is involved) with the sponsorship of the IDRC. This required the publication of a bibliography similar to those produced for rice and corn at centres in Mexico and the Philippines. In 1972 CIAT and IDRC agreed to cooperate in developing an information project – the Cassava Information Centre.

The project was conceived as an integrated documentation service comprising bibliographic compilation, continuing information to subscribers and selective search capability. As a basic requirement for this system it was necessary to prepare a glossary on cassava based on the keywords used in CIAT's cassava program. This accomplished, the punch cards were then revised and up-dated for consistency.

Another major undertaking in the early stages was the collection of existing documentation on cassava at the world level. Literature on cassava is sporadic and scattered in numerous publications in many countries. Nonetheless, by October 1975 the centre had completed the acquisition of an estimated 90 percent of all the important documentation on the subject.

The management of this unique collection of data calls for a methodical approach. Documents are first consecutively numbered, catalogued and matched with their

authors' resumes. Then comes the crucial point in the process – the allocation of keywords. Crucial because it is through them that it will be possible to retrieve the document according to specific subjects or a user's special field of interest. Consequently it is the centre's policy to use too many keywords rather than too few. The keywords are added to the "peek-a-boo" system and a typed summary card is prepared for each new document, reduced, printed and distributed to subscribers, who may order a copy of the document or retain the card for reference.

As of October some 2,600 articles had been processed and a bibliography containing some 2,000 references was close to publication. The centre has 450 direct subscribers, and a considerably larger number of indirect users. In addition the centre provides a data search service in response to enquiries for information on specific topics. For the future it is hoped to continue building the data base, while simultaneously expanding the editorial aspect of the centre's work to include the publication of a periodic cassava information bulletin and a manual on diseases, pests and deficiencies affecting cassava.

The cassava information centre is one of several specialized centres that will form part of the worldwide AGRIS information network, also supported by the IDRC. It is just part of the overall capacity of CIAT's documentation centre, which also covers animal sciences, beans, and Latin American agricultural economics.

Fernando Monge believes the work is vital. Researchers currently produce a large amount of information that is never published in the conventional media, he says. "I believe I do not exaggerate in saying that perhaps not even one percent of the information produced by research is disseminated by conventional publication media," Monge told the International Association of Agricultural Librarians and Documentalists in Mexico City earlier this year.

"Documentation centres and libraries must seek information where it is generated as it is generated, and develop appropriate systems to achieve immediate dissemination to the scientific community... The modern documentalist's function is to tell the expert: this is of interest to you."

Focus on Africa

On the following pages a series of articles focus on the efforts being made to solve some of the problems facing the nations of the world's second largest continent — Africa

It costs as much to heat the pot as to fill it...

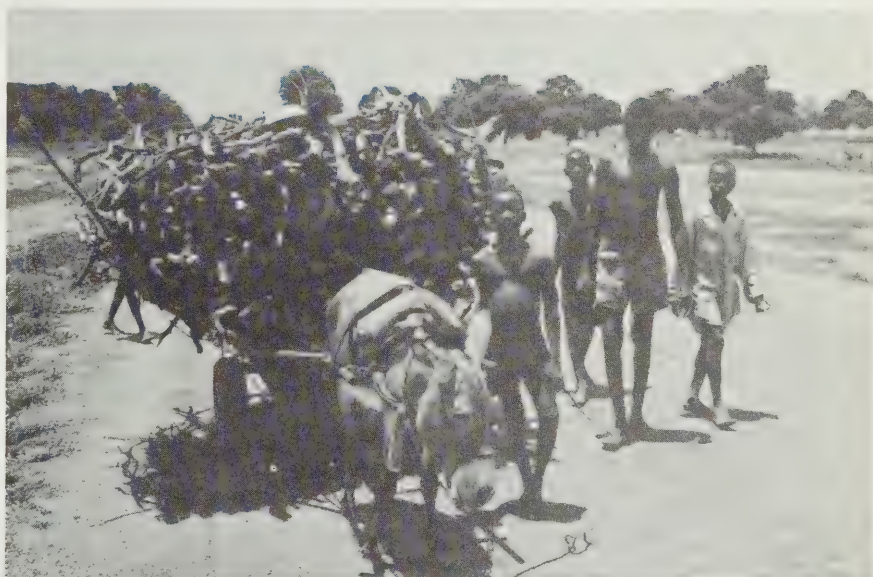
Clyde Sanger

Two years ago, at the height of the drought that wreaked such havoc in the Sahelian zone of Africa, the head of the forestry service of Niger, Najada Ibrahim, went visiting his mother in her village of Maradi. He took her a present: a small bundle of firewood.

Gilles Lessard, the IDRC's associate director for Forestry, who was with him that day, recalled afterwards: "She received it with great joy. It was like giving her a bunch of flowers."

There have been two years of good rain since then. At the research station at M'Bidi, in northern Senegal, they started planting out acacia seedlings in mid-July this year, a full month ahead of normal, because there had already been 100 mm of rain. Yet a crisis remains, and in fact grows worse each year, for the millions who need fuelwood to cook their meals, and to keep themselves warm on cool nights, in the dry areas of Africa verging on the Sahara.

The mathematics of the problem are stark. Each person living in a town or city in this area needs one cubic metre of stacked firewood (equivalent to a stere) per year. The annual growth in a hectare (2.47 acres) of natural forest is on average only half that amount; so every towns person needs two hectares of natural forest — somewhere.



These boys may spend several days on the road hauling firewood over long distances for sale in the city.

The "somewhere" gets more and more distant as cities grow. Until recently in Bamako, the capital of Mali with a population of 300,000, nobody used to haul firewood more than 50 kilometres; now it is common to go 100 kilometres, and by 1990 the radius will extend to 155 kilometres or further.

By 1990 the three largest cities in Upper Volta, even if their population only doubles to 550,000, will need

the amount of wood that can be produced from 75,000 hectares of plantations. The cost of planting 5,000 hectares a year for the next 15 years would mean an astronomical investment for such a small country: at present costs of \$7,000 per hectare, it would come to more than \$52 million. No government in the Sahelian zone of Africa is going to put that amount of investment into firewood production.

Meanwhile, at the level of the individual household, the cost of firewood is heavy; the price rises not just during the rainy season, but steadily now as it has to be hauled further distances, and more often by small truck than by donkey-cart or on someone's head. Many families spend up to 20 percent of their income on firewood. A recent survey carried out in Niamey, Niger, indicated that 25 percent of families have only one hot meal per day on account of the high cost of firewood. There is a common saying in West Africa: "Il coûte aussi cher de chauffer la marmite que la remplir" (It costs as much to heat the pot as to fill it").

It all sounds hopeless. Yet there are possible solutions, and African politicians and officials have listed them:

- substitution of gas (oil, butane) for fuelwood

- use of solar energy
- greater use of charcoal
- higher production of woodfuel in plantations, either dryland or irrigated.

Some words follow on each of these possibilities.

The Senegal Government has run a "butanization" campaign, but with little success. Foreigners and the wealthier Senegalese may use butane, but poorer people cannot afford to buy a new type of stove. Petroleum products might seem the natural substitute for wood in cities of northern Nigeria like Kano, where trucks now travel 100 miles for firewood; but this substitution has so far gone slowly throughout oil-rich Nigeria.

Use of solar energy is a relatively new idea in West Africa, although in Niger (for example) they are experimenting with it in water heating and distillation. A conference on the use of solar energy was held in Dakar last December, a first step down a long road.

The other two possibilities are exciting more immediate interest, and Canadian groups have been active in helping African governments explore both avenues.

There are strong grounds for promoting the greater use of charcoal in towns of Sahelian Africa. It is already the most common fuel in Senegal, where it is not only used by households but also by small industries (bakeries, brickworks, foundries) and also in the smoking of fish. It is similarly used in Mali, Upper Volta and Niger but to a far lesser extent.

The advantages to the user of charcoal are that it burns without smoke and is easily controlled in household or factory use; that it can be easily transported long distances (it is brought into Dakar from 300 kilometres away), being packed in jute sacks; and it keeps well, in rainy or any conditions. Also, only the simplest equipment is needed, since a stove can be made out of an old tin.

For the country as a whole there are other advantages. A great deal of wood goes to waste during cutting operations in the tropical high forests of West Africa. In many parts only about one-quarter of the forest is used for lumber, the rest consisting of unsuitable species that are burned or left to die and rot. If this wasted wood were converted instead into charcoal, the forests would be better managed, clearing operations would become profitable and thousands of jobs would be created from this industry. The charcoal would be trucked or railed up-country to the cities of the Sahelian zone.

It all makes for a pretty solution, but there are some blemishes. At present in some countries, like Ghana, the charcoal traffic goes the other way, from the needy north to the coastal cities where people can pay more for it. In Nigeria there is a general war-

iness towards charcoal, due to incidents of monoxide poisoning. The railways don't seem too keen on a large business in charcoal freight, and the rivers flow the wrong way—to the sea, not inland.

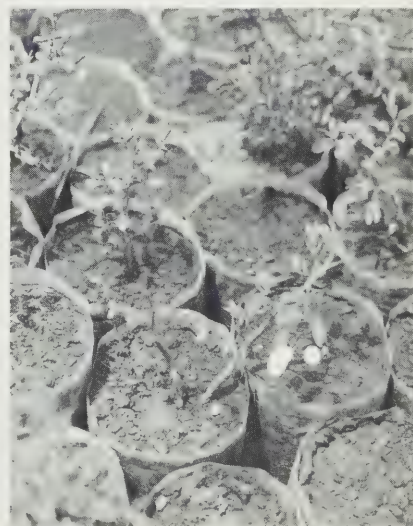
Nevertheless, a three-man study mission headed by Dr D. E. Earl, who years ago blazed a trail for charcoal-makers through the forests of Uganda, spent 10 weeks at the end of 1974 touring nine countries of West Africa and investigating opportunities to use charcoal in much greater quantities as low-cost fuel for households and industries, especially in the Sahelian zone.

Their report is still a confidential document in the Canadian International Development Agency, which recruited the team. But it breaks no confidences to say it is a generally optimistic document, and as a result of it may soon come CIDA support for some large-scale operations. One possibility scouted by the mission was a salvage operation on 40,000 hectares of forest in southern Mali which within a decade will be inundated by the waters of Selingue reservoir. A well-planned operation to make roads into this area, and to fell and carbonize the greater part of these forests over a five-year period, could provide Bamako with all the charcoal its people need for years ahead.

The fourth possible solution to the firewood crisis is to grow many hectares of new plantations in the Sahelian zone itself. Strangely enough, it is a very new idea. Nigerian foresters, who have been well organized for many years, have concentrated their work below a line to the south of Kano, in the so-called Soudan zone. Before 1967 there was little research done on forestry in the Sahel; such stations as there were usually were manned by a single, lonely forester who kept scanty records. In January



Forestry nursery in Senegal: a scheme of reforestation designed as a model of integrated land use management.



Tiny acacia Senegal seedlings may provide hope for the future.

1974, Gilles Lessard organized a meeting in Dakar of forest research scientists from six countries. It was the first time such a regional meeting had ever taken place.

That meeting of what was called a Savannah Forestry Working Group generated a lot of momentum and produced several proposals for action. Today the IDRC is supporting research projects in most of these countries along the lines set out in Dakar.

The participants were asked to assess what would be their priority projects on the basis of three criteria: financial rate of return, effect on the quality of the environment, and job creation. Their marks came down heavily in favor of research involving the establishment of shelterbelts, irrigated plantations and projects of soil restoration.

Their interest in irrigated plantations is based on the calculation that plantations of exotic species such as the Australian eucalyptus can produce 50 times the annual growth of the natural forest. One hectare could support the firewood needs of 25 townspeople, a heartening reversal of the figure quoted earlier.

But how can this be financially effective, if it costs governments \$700 for every hectare of plantation established? The only way is to make it worth the local villagers' while to do it on their own, in lots of small packages.

This is being tried in the Zinder district of south-central Niger. It is an area of fair farming land, and forest has been sacrificed to farming. A good deal of the wood still cut there is smuggled south into Nigeria for higher prices. But since 1974, after forestry officials sat down with village councils for long discussions, six villages have taken land out of farming to establish village woodlots that will provide firewood for the whole community. Within five years, it is hoped 70 villages will have such woodlots, which will save the women long walks for firewood. If these can be established in a mainly rural setting, they can also be tried inside a radius around larger cities and the villagers in that radius can earn an income providing wood for Niamey and other towns.

Desertification is not a uniform advance of the Sahara on all fronts. It is a blight occurring only in spots, like the barren area around large cities—or around waterholes where herdsmen and their livestock have destroyed the cover. In the "inner delta" of the Niger River, around Mopti and other fishing centres, the woodlands have been denuded for fuel with which to smoke the catches of fish.



Photo: Gilles Lessard

The Mali Government is now experimenting to find the appropriate species for intensive plantation under irrigation near N'Doubougou in the inner delta area. They hope these plantations will provide not only wood for the use of the fishing communities but also a windbreak in the shelter of which vegetables can be grown.

At M'Bidi in northern Senegal the herds have grazed and stripped away the tree and ground cover around the well area. A scheme of reforestation, designed as a model of integrated land use management, is now under way on a 200-hectare site: not only wood for fuel, but land protected for vegetable gardens, and a better quality of gum arabic from the acacia trees. If the herdsmen can recognize such plantations as being a multiple source of income in these forms, they will be more likely to protect than destroy them.

Other research on how to establish shelterbelts, the best species to plant in various places and the best techniques to maintain them, is being carried out in northern Nigeria and in the Kerma Basin of northern Sudan.

This area of the northern Sudan used to be farming land when the Nile and its tributaries flooded into the depressions; but with the construction of dams the flooding ceased and sand blew over the furrows. Some species of eucalyptus (such as *Eucalyptus camadulensis*) have thrived in similar conditions in northwest Australia; so these and other species are being tested on a 100-hectare site north of Dongola, in hopes that within four years onions, peas and other vegetables can be grown in irrigated plots inside this shelter.

In Kenya the land suitable for agricultural crops is much smaller than all the films of lush countryside tend to suggest. In the last decade

thousands of hectares of land planted to forest in high rainfall areas during colonial days have been cleared for agriculture. Rather than try to fight the farmers on this issue, the forestry department is experimenting with species that may grow on marginal land near the coast and in western Kenya and provide the people with their woodfuel needs, while opening up more of the Rift Valley for farming.

These, and other research projects such as one concerned with improving the production of alfa grass in the semi-arid parts of Tunisia for harvesting for the pulp and paper industry, could be duplicated in other countries of Africa. The Sudan is as interested in improving the quality of gum arabic, used as a stabilizer in the manufacture of paints and pharmaceuticals, as in Senegal. What is important is that each country learns what is happening elsewhere, and benefits from the research.

It was a prime recommendation of the working group that met under IDRC auspices in Dakar in 1974 that a documentation and coordination centre for forestry research should be set up in the area. A regional group is now in the process of drawing up detailed plans. Such a centre will give momentum to the movement that has begun among scientists in Africa to solve their fuelwood and forest crisis.

But success depends on strong support coming from political leaders. This is where much uncertainty remains. Some leaders have learnt lessons from the seven-year drought; others, cattlemen by background, are mainly concerned to see the great herds reconstituted, regardless of the carrying capacity of the land and unconcerned about the needs of townspeople for fuel. Which view prevails is important for a large area of Africa.



Photo: Bob Stanley

Senegal tackles land issues

Bob Stanley

At a first glance the two maps on the wall of the agricultural research station in rural Senegal appear identical. Each is a vivid patchwork of bright colours and bizarre shapes forming apparently random patterns. But a closer examination of the second map reveals a rather more orderly world than that depicted in the first, with fewer and more regular shapes, and less proliferation of colours.

In fact, the maps are a graphic illustration of the outcome of months of painstaking surveys and delicate negotiations. They show several villages and the surrounding farmland in a small area of the Siné Saloum region of Senegal: one of the more fertile farming areas in this former French African colony bordering on the drought-stricken Sahel.

Despite the vagaries of its climate, Senegal has a predominantly agricultural economy, and the government long ago established rural development as the main priority of its development plan. In 1968 the Institut sénégalais de recherches agricoles (ISRA), the national agricultural research institute, established two Experimental Units in the Siné Saloum region. These are villages and the surrounding farmlands where new agricultural techniques are introduced and tested under real conditions.

Researchers from the Centre national de la recherche agronomique (CNRA), the national agronomic research centre that is an agency of ISRA, have concentrated on farming techniques and the introduction of new crops or new varieties, together with improved storage methods, in the hope of stabilizing food supplies and increasing farmers' incomes.

Little in-depth work was done in the first years on questions of land tenure and usage. Yet, as the new techniques brought marked changes to the villages and the surrounding area, it became increasingly apparent that the complex questions of who owns what land, and how he uses it, had to be resolved. For the complicated tangle of land tenure issues—often resulting from several systems of land law being superimposed on customary or tribal law—was becoming more and more an obstacle to further progress, in spite of a national land policy enacted in the Loi du Domaine Nationale in 1964.

In 1973 the government of Senegal asked the IDRC to assist in an extensive in-depth study of land tenure problems in Senegal, based on the Experimental Units in the Siné Saloum. The objectives: to gain a clearer picture of the existing systems, from both the historical and the social perspective with a view to bringing about more rational and equitable land usage; to test new, simpler and less costly methods of surveying and identifying land titles; and finally to facilitate land regrouping favourable to the introduction of improved agricultural methods.

Madické Niang is a young Senegalese who joined the project team in August, immediately after graduating from Dakar University. He is something of a rarity in that he chose to work out here in the villages, rather than joining the majority of his peers among the comforts of Dakar. "This is where my heart is," he says. And he means it. Enthusiastically he jabs at the two maps, indicating the considerable progress that has already been made.

Farmer A was persuaded to cede a part of one of his fields to Farmer B, who in turn ceded part of another field to Farmer C, who in turn ceded part of another field to Farmer A. All three wind up with the same amount of land, but in parcels of a more manageable size and shape, and perhaps better suited to specific uses.

It all sounds very simple. A few adjustments here and there, and everyone is better off. But the ownership of land is a sensitive subject anywhere in the world, and Senegal is no exception. To allay the farmers' fears that they might somehow lose out, explains Jacques Faye, the senior Senegalese researcher on the project, strict criteria for the exchange of land have been drawn up. These govern such things as the minimum desirable size of field, types of soil, and location of fields (it is quite common for one farmer to have claim to a number of fields spread over an area of several miles).

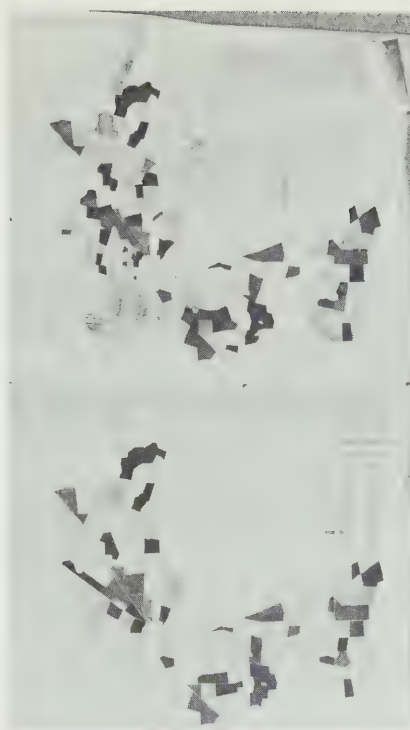
In the course of reorganization many long standing disputes over land have been brought out into the open—and conflicts resolved. Jacques Faye says the farmers see this as one of the big advantages of the scheme: giving them "clean" titles to their land where before there was insecurity or conflict. In the process much has been learned about existing land tenure schemes, and Faye is confident that they will soon be able to make many recommendations to the government that will result in improvements in the national land policy legislation.

Driving through the countryside around the village of Thyse Kaymor, one of the Experimental Units, Madické Niang stops frequently to point out changes. Before reorganiza-

tion there were some 322 fields here with an average size of 2.7 hectares, covering a total area of 870 hectares. Now there are 248 fields with an average size of 3.2 hectares. The larger, more regular shaped fields are easier to work. Trees and other obstacles have been removed, and many more trees and hedgerows planted to mark new boundaries, roadways, trails and common grazing land. Efforts are being made, too, to prevent further soil erosion which is a serious problem during the rainy season. Crops new to the region, such as cotton and cassava, are being tried. All this has taken place in 18 months since the project began operating.

Another important aspect of the project is the work with rural councils. Although the land legislation of 1964 called for the creation of local government units, only recently have a few pilot rural councils come into existence. Now the project staff under Jacques Faye have begun a program of training the council members—usually elders, religious chiefs and landowners—who will eventually be expected to manage land questions in the area.

From the experience gained in settling land disputes they are able to advise the councillors on questions such as registry of titles and general management of the community. They are also providing training on such subjects as cooperative systems, preparation of budgets and land use management. In this way Faye hopes that



Before and after: fewer fields, larger fields, and more regular shapes for easier working.

the councillors will become qualified to help in finding solutions to the application of the national land policy.

What does it all mean in terms of production? J. F. Richard, a French researcher from the CNRA, points to a field where men are harvesting a good crop of millet. The yield from

traditional crops such as millet, sorghum and groundnuts has been doubled, even tripled, he says. In addition they are able to introduce new crops. Corn, for example is yielding four tons per hectare. Ten years ago corn simply did not exist as a crop in Senegal. The improvement has also allowed the introduction of cash crops such as cotton, something new in a region where subsistence agriculture is the rule. But what really counts, says M Richard, is that at the end of the long dry season there will still be some grain in the storage bins.

What is happening here at the Experimental Units is unique. It is the first such land regrouping project attempted in Senegal, and as such it is attracting a great deal of interest, both from within Senegal—no less than five government ministers have visited the area since work began—and from other West African countries.

One of the institutions cooperating in the project is the Institut Fondamental d'Afrique Noire. IFAN draws its research staff from several countries, and through them the experience gained in the Siné Saloum could be spread to other West African countries which are facing similar problems.

'IDRC Reports' editor Bob Stanley recently visited a number of projects in the West African region.

Land erosion during the rainy season is another problem.



Harvesting millet: improved fields combined with new agricultural methods can result in a doubling or even tripling of the crop.



Focus on Africa



No mass information campaign was used in the Mali program — the message was spread by word of mouth.



Mali's unique approach to family planning

Family planning is a sensitive issue anywhere in the world, but perhaps nowhere more so than in French-speaking West Africa, where all countries but one forbid by law the manufacture, sale or advertising of contraceptives.

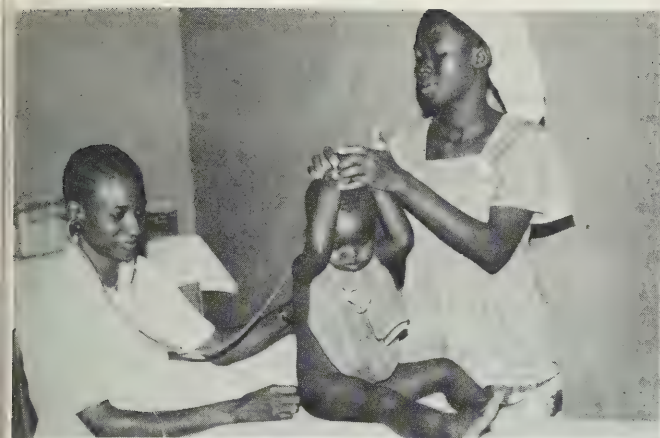
The one country that has shaken off this hangover from the French colonial era is Mali. Recognizing the importance of social changes being brought about by such factors as increasing urbanization, educational and employment opportunities for women and a growing divorce rate, the Malian ministry of health in 1971 invited the IDRC to cooperate in a unique pilot family planning project.

The approach was to be strictly low-key, fitting within the framework of traditional values (Malian society has a long tradition of birth spacing) and with the emphasis on family planning for reasons of health and family welfare. The objective: to obtain data on traditional fertility control practices and the changes they are undergoing, with a view to the formulation of a national family planning program.

In 1972 a pilot clinic and four branch clinics were established in the capital, Bamako. In spite of the fact that there was no overt publicity for the program, the clinic received more than 2,000 clients in about 10,000 consultations during its first two years, representing about five percent of the child-bearing population of the city.

The study revealed that urbanization has weakened traditional birth spacing customs, often vital to the health of both mother and child. Some 68 percent of the

Malian society has a long tradition of birth spacing, a factor that influenced the planners.



Left: Bamako's clinics care for both mother and child. Above: the program's director Dr Faran Samaké with staff at the clinic.

e approach planning

clinic's clients expressed the desire to space their children, while only 22 percent wanted to stop having children.

Training was also an integral element of the project. Since the clinic opened eight doctors and 10 paramedics have been taking part in consultations every week. About 10 paramedics have been trained in this way, and in addition the data gathered has been widely used in lectures, seminars and even neighbourhood meetings on family planning.

Now the ministry of health is moving to establish further seven clinics (two more in Bamako and one in each of the country's regional capitals) making the program truly national. At the same time it announced the planned merger of maternal and child health services into a National Family Health Service.

Family planning in future will be one of the health services provided by the government—one element in a policy for improved health and social welfare. The program does not seek to create new needs for contraception, or to modify the aspirations of the population, there are no many other vital health needs.

By taking this uniquely non-demographic approach and avoiding any suggestion of using family planning as a means of population control, the Malians have demonstrated to their neighbours one solution to the family planning question. The Malian experiment has been closely followed by other governments, and its success is likely to have a considerable influence on policy for the entire region.



The health of the child is a major concern — the infant mortality risk is doubled if a child must be weaned too soon.



Wedding Bamako style: women and families face new problems in a changing society.

Focus on Africa

Global effort to combat tropical diseases

Alexander Dorozynski, associate director, Publications Division, previews a major collaborative effort to eliminate crippling tropical diseases in Africa.

At any time, up to a billion people may be suffering from one of the tropical diseases that represent a major obstacle to development. Three of the diseases – malaria, filariasis and schistosomiasis – affect 200-million or more each. In some tropical regions, people harbor several disease-producing parasites simultaneously, from childhood on to premature death. In many rural regions, it is taken for granted that children pass blood in their urine, that one in ten villagers is blind in the prime of life, that people are disfigured or crippled by leishmaniasis or leprosy, that epidemics of lethal diseases like measles or meningitis can strike at any time, and that every child in a community will suffer, at one time or another, the paroxysms of malaria fever.

Yet, since the Second World War, there has been an extraordinary explosion in biomedical sciences, that has revolutionized not only fundamental knowledge, but medical care in the industrial world. Huge investments in biomedical research have permitted the prevention of treatment of heretofore "incurable" diseases, such as certain types of cancer, Parkinson's disease, hypertension, poliomyelitis and many others.

But little of the knowledge, money or effort have trickled down to the poorer countries, where tropical diseases still close the door to a better and more productive life.

It is to help correct this situation that the IDRC is collaborating in a major effort undertaken by the World Health Organization (WHO), an intensive program to go on for at least 10 years, and to involve top researchers and a network of collaborating laboratories. Dr Halfdan Mahler, WHO director-general, describes the campaign as "a new adventure which sets itself completely within the context of the new economic order, or, as I prefer to say, the new development order."

Key requirement to get the campaign started is money. One of the reasons why the advances achieved in biomedical sciences have hardly been applied to the problem of tropical diseases is that the total research budget for all tropical infectious diseases has been pitifully low: the global investment is estimated at about \$30 million a year, about one-tenth of the annual cancer research budget of one single country (the US). Contributions will be sought from international agencies and developed countries, but also from the developing countries where the bulk of the research is to be carried out.

The initial approach involves an effort directed at six of the major tropical diseases: malaria, schistosomiasis, filariasis (including onchocerciasis, or river blindness), trypanosomiasis (sleeping sickness and Chagas' disease) and the different forms of leishmaniasis. These constitute the crux of the problem, and it is believed that the number of tropical diseases is too great to propose a single plan to encompass all of them from the start. Spin-off from intensive research on the major diseases, however, will undoubtedly advance knowledge in others. For example, the development of a vaccine against leprosy could lead to a method of developing other vaccines, and the study of the interaction between one parasite and human cells, to better drugs against all parasitic diseases. Malnutrition, a factor related to all tropical diseases, will be included in the program.

Two interlocking systems are proposed to tackle the problem:

- Task forces: these would be groups of top-notch scientists to be chosen for their qualifications to pursue this goal-oriented research. For the past two years, such a task force has been working as a pilot operation concentrating on the development of a diagnostic skin test and a vaccine for leprosy.
- Networks of collaborating laboratories. One of the problems in the past has been poor or non-existent coordination between various research and clinical centres. The network is to take advantage of existing organizations, establishing communications between them, and boosting staff when it is insufficient. A framework already exists: the East African Medical Research Council, with seven laboratories in Kenya, Tanzania, and Uganda; the Nigerian Medical Research Council; the Ndola Research Centre in Zambia and others, including the 25 university medical schools in tropical Africa and the European-supported research laboratories and organizations.

A major goal is the training of African scientists, but it is recognized that, for the time being, the necessary knowledge and skill is chiefly to be found in the industrial world, and that their involvement is crucial.

With initial financing of about \$2 million, to which the IDRC has contributed, the campaign is now being organized. Africa, the continent most affected by a majority of these diseases, will be the focus of the initial effort, but laboratories elsewhere will also play a role in a program that is not a continental but a global one. The next step will be to ensure continued financing as of next year.

REGIONAL NEWS

Focus on Africa

Nairobi

Without any fanfare the Centre's fifth regional office became operational in October. This is the East African Regional Office (EARO) in Nairobi, and a broad interpretation has been put on the term "East Africa," since the job of its staff will be to keep in touch with governments and research projects in 16 countries that spread from Rwanda to Mauritius, and from Ethiopia to Lesotho. Consequently the staff prefer to call it the regional office for East and Central Africa.

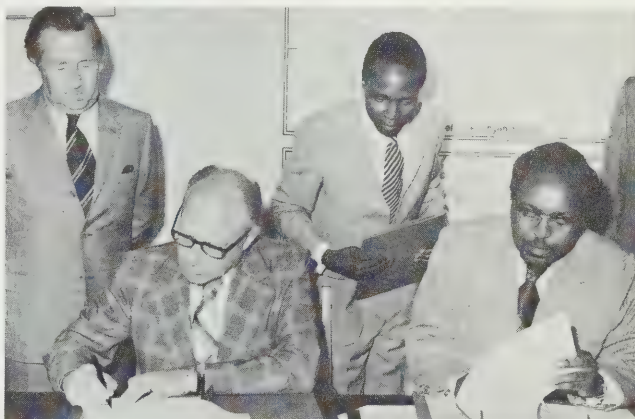
Nevertheless Tony Price, who moved from West Africa to become EARO's first regional director, sees this as a manageable task compared with the one that faced the Dakar office in the first 18 months after it was set up in early 1973. He and the other Dakar staff were covering not only West Africa, but North Africa, the Middle East and East Africa as well. Even after the Beirut Office started operating late in 1974, the task of covering all Sub-Saharan Africa from its westernmost point was full of difficulties: distances were tremendous and communications poor. If the IDRC was to be responsive to the views and the needs of governments and research workers in Eastern Africa, it would have to involve a closeness that neither Dakar nor Beirut could provide. Finally, there are fundamental differences between West Africa and East Africa of which account had to be taken. A Nairobi office was decided upon as an answer to these concerns.

Things have moved quickly since the decision was taken. The agreement enabling its establishment was signed by Kenya's Foreign Minister, Dr Munya Waiyaki, and IDRC President David Hopper on May 21. From mid-August premises were rented on the fifth floor of Bruce House, a newish building in the city's business centre. Within six weeks adjustments in partition walls and other alterations had been completed, to provide a convenient set of offices for a full complement of program officers, as well as a library, conference room and other facilities. And by mid-November EARO had helped stage its first workshop on post-harvest food grains technology – which brought together 20 participants from seven countries. A second workshop, "The Social and Managerial Aspects of Rural Water Supply and Sanitation," followed in December.

Despite these activities, the EARO staff is still small. Besides the director, there is the assistant director, Trevor Chandler, a Canadian who has been working for four years in Tanzania at the Olmoutonyi Forestry Institute in charge of beekeeping research and training. Virginia Guerrero, who grew up in Chile and has worked in Geneva, came as Executive Secretary. Miriam Sozi, who, while in Uganda, worked for the Office of the United Nations High Commissioner for Refugees, was the only secretary until joined by Helen Kasera. Joseph Githae, David Mwendwa and Levi Adakha complete the support staff. George Ovuor, who has been senior operations manager of Air Kenya, joins as the Administrative Assistant on January 1. Of the program staff, so far Robert Leblond, of the Information Sciences Division, has been appointed and he arrives from Ottawa in January.

The first two months, then, have been occupied with internal organization and the management of these two workshops. At the beginning of 1976, Price and Chandler plan extensive travel to familiarize themselves with the area and to make contacts with governments and institutions. The full list of 16 countries covered by EARO is: Botswana, Burundi, Comoro Islands, Ethiopia, Kenya, Lesotho, Malagasy Republic, Malawi, Mauritius, Mozambique, Rwanda, Somalia, Swaziland, Tanzania, Uganda and Zambia.

From April onwards will come a third phase, of absorbing program representatives into EARO. A program focus of the different divisions in Eastern Africa is already discernible but is likely to enlarge. For example, Information Sciences has so far been limited to cartography (in Ethiopia) and a library training experiment (in Mauritius) but is soon to include the interpretation of satellite information on earth resources. Social Sciences has mostly been concerned with development administration, but rural-urban dynamics is another possibility. In the field of health sciences research, sanitation and rural water supplies are becoming a prime concern.



Foreign Minister Waiyaki and IDRC President Hopper sign the agreement to establish a Nairobi office.

Of the 20 projects already under way in the region, half are in the sphere of agriculture and animal sciences. Several of these projects involve research into the improvement of sorghum as a food crop. The long experience in this area of AFNS associate director, Hugh Doggett (now working out of India) is a great asset. The triticale trials in Ethiopia and Kenya are closely linked with the breeding program in Mexico. Other crops in which research may soon be supported include various oilseeds.

A major initiative in Kenya is in the area of animal diseases, and in particular trypanosomiasis: the government is anxious to keep a balance between the wild life from which comes so much foreign exchange in tourist dollars, and the domestic livestock on which rural Kenyans depend, so that greater knowledge and control of the diseases that pass between wild and domestic animals is essential. A first forestry project is under way (also in Kenya) and possibilities for aquaculture research are also being explored.

The IDRC program in Africa began with strong concentration upon the problems of the semi-arid tropical zone. This will no doubt continue to be a major concern, but the establishment of EARO also puts the Centre into a sounder position to extend its activities among the independent countries further south.

CLYDE SANGER

BRIEFS

Asian food scientists forge ahead

The Singapore meeting in March 1972 that created the Advisory Group of Asian Food Scientists and Technologists marked an important milestone for both the IDRC and for food science in general in the region. The meeting set the thrust and orientation in food research that continue to guide the Centre's program in that field today.

The Group set itself a number of specific objectives: to identify problem areas on which to base research priorities; to identify national institutions with specific research capabilities; to develop training activities; to collate and disseminate food research information; and to make recommendations for the development of research networks.

In October this year, once again in Singapore, the Advisory Group held its fifth meeting, for the purpose of reassessing the Group's role and functions, identifying new areas of research development and training, and assessing regional capabilities in the field. Representatives of India, Indonesia, Malaysia, the Philippines, Singapore, Sri Lanka and Thailand reviewed three years of operations, during which commodity working groups have been established for rice post-harvest technology, legumes processing and fish processing. Closely integrated regional research networks are now being set up as projects get underway in each of these areas.

Members of the Group reported on the training facilities

available in their countries. With the exception of the Central Food Technological Research Institute at Mysore, India, training facilities in the region offer essentially academic-type training in highly specialized fields, such as tea and coconut technology in Sri Lanka or rice post-harvest technology in India and the Philippines. The Group agreed to compile a complete list of specialized training facilities available in the region. Such training will be made available through bilateral arrangements between the countries concerned, or on a regional basis with external support.

The meeting also identified three new areas of research priority. Working groups on the processing of fats and oils,

processing of fruits and vegetables, and food quality control will be organized early in 1976.

To encourage maximum utilization of technical and financial assistance the Advisory Group agreed to prepare a document on the management of technical assistance from the recipient's viewpoint. This paper will cover both the advantages and the disadvantages of current practices in project identification and implementation, training, evaluation and monitoring. It should be particularly useful to donor agencies such as the IDRC in their attempts to assist developing countries to attain scientific self-sufficiency.

*E. V. Araullo
Senior Program Officer
Singapore*



Valerie Kelly stirs the pot: the water's hot but not boiling — yet, but it's only a matter of time.

Solar energy: it's the doctor

If you're in Bamako, the capital of Mali, and you happen to drop by the home of Dr Patrick Kelly and his wife Val unannounced, you may find him climbing a tree to get onto his roof, or perhaps setting up a large reflector beside a tripod in the backyard.

Dr Kelly, you see, is not your average MD. Medicine is his specialization, to be sure, and he is in Mali to assist in the second phase of the IDRC-supported Mali family planning project, but he sees the doctor's role as being related to a lot more than just medicine. A lot of very practical things that don't necessarily require large outlays of money, or applications of modern tech-

nology, or even very much education.

Which is why, on any given day, you may find Pat Kelly up on his roof. For up there is his pride and joy: a solar water heater he built himself. It's made from coiled black rubber hose, a wood frame, two panes of glass and some masking tape, and it provides the Kelly household with all the hot water they need any day the sun shines — which if the Mali tourist advertising is to be believed is about six days out of seven.

"Of course it could be a lot more efficient if it were made out of metal," says Pat, "but I wanted to use the cheapest locally available materials. All

Sorting the wood from the trees

The five member countries of the Andean Pact Commission—Bolivia, Colombia, Ecuador, Peru and Venezuela—have between them a total of about 200 million hectares of humid tropical forest containing 650 exploitable wood species. Yet less than 0.1 percent of these resources are used adequately, and the over-exploitation of some 50 species is resulting in the deterioration, even the destruction, of the remainder of the forest.

Now the five are joining their efforts in a cooperative research program aimed at a greater and more rational exploitation of the region's vast forestry resources. The 30-month program came about as

a result of an IDRC-supported study to establish a regional strategy for the promotion of industrial development, begun in 1971. IDRC President, W. David Hopper recently announced that the Centre will provide about 60 percent of the funding for the new \$1.7 million program, with the five Andean nations providing the balance.

In contrast to Africa and Southeast Asia, Latin America's humid tropical forests contain a large number of different wood species, but with a low density of the same species per area unit. There are about 400 species that might have commercial potential if more were known about their volume and their properties. At present a few species are

exploited exhaustively for decorative export products, and 80 percent of all trees felled are used simply for fuel.

The study will concentrate on developing products for the building sector. The hardwoods will be tested for characteristics such as durability, compression strength and elasticity. The technology of joining hardwoods will also be studied, and tests conducted to establish optimum dimensions for beams and columns according to load varieties. Experiments will also establish the best means of protecting certain species from insects and fungi. All this information will be made available to civil engineers, architects and universities.

An important aspect of the project will be training and the

exchange of personnel and technology. Each country will carry out forest sampling on 20 different species; graduates from Bolivia and Ecuador will work in Peru and Venezuela; both Australia and France will offer training in design and wood cataloguing.

In addition to improving the efficiency of the utilization of forest resources in the region and promoting the preservation of endangered wood species, it is expected that the project will help meet the growing demand for wood for the building industry and open up work and income opportunities to the poverty-stricken sawmill workers and manual slashers.

Susana Amaya

st what dered

this could easily be made here." The heater is small (about 2 feet by 3 feet) and contains only a few yards of pipe. Yet it heats a 50-gallon drum. "Imagine how much hot water you could produce with 100 yards of pipe," muses Pat, gazing speculatively across the large, flat roof.

"Just think what it would mean to, say, a rural dispensary to have an almost unlimited supply of hot water."

Not quite so successful, yet, is the solar cooker—a large reflector constructed from cardboard and aluminum foil. When focussed on a pot of water it will bring the contents almost to the boil. Almost, that's the problem. Dr

Kelly wants it to boil water, and he's not sure why it won't. But he's working on that, too, in his spare time.

The Kellys' solar energy projects are a lot more than just an ingenious hobby. The rooftop water heater in particular has stirred up a good deal of local interest. Such diverse dignitaries as a trade union leader and a hospital director are sufficiently interested to want to come and see it in action. Which means that the Kellys are going to have to acquire a ladder from somewhere. Pat is afraid that the tree might not stand up to all the traffic.

Bob Stanley



The study will concentrate on developing products for the building sector.

Development begins in the home...

A new approach to rural development in Colombia

The mountainous Eastern Cundinamarca region of Colombia is one of the poorest regions of the country. Its largely rural people are mainly small-scale subsistence farmers, growing corn and potatoes, and perhaps tending a few cattle, pigs or poultry. The average family size, according to a 1971 survey, is 7.5; yet 40 percent of the houses have only two rooms (which are often shared with the livestock) and almost 80 percent have no sanitary facilities or water supply. Some 60 percent of the population have attended only primary school—all the region's 18 secondary schools are in the towns. Almost 60 percent of the population is under 20 years old.

This is the area in which the Colombian Agricultural Institute (ICA), in cooperation with the IDRC, has been carrying out an innovative rural development program since 1971. Although the primary aim of the project is to generate income-producing programs, household management—covering such factors as health, nutrition, sanitation, housing and education—has been an important aspect since the beginning. This part of the program is now entering a new and successful phase, but there were some obstacles to be overcome along the way.

The above article is based on a report by project staff Lelia Cruz, Elizabeth Shipley and Kenneth Swanberg that originally appeared in Spanish in 'CIID Informa'.



Photos: Jaime Rojas

In the early stages of the project the household management group attempted three initiatives: sewing and handicrafts instruction, a housing expansion and improvements program, and discussion groups on health, nutrition and family planning. Early enthusiasm among the people soon waned, however, mainly as a result of lack of markets for handicrafts, lack of expertise and credit for housing, and lack of interest in discussion groups. So in 1972 the group went back to basics and surveyed the peasant families to find out what were their priorities.

Ironically, handicrafts and home improvements emerged at the top of the list. However, in the course of the survey researchers observed a good deal of malnutrition among the peasant people. Since food and nutrition also ranked high on the people's list of priorities and this was obviously an urgent need, it was decided to concentrate on this aspect as the one which the household management group was best equipped to tackle.

A study of the eating habits of 259 families showed that, while malnutrition was more severe among lower-income families, consumption of essential calcium and vitamin A nutrients was generally deficient, and bore little relationship to family income.

As a direct result of these findings two pilot pre-school centres were established early in 1974 with the cooperation of local teachers—one in a low income district and one in a higher income district. Here, twice a week for two hours, the pre-schoolers learned what school was all about (and enjoyed a high-protein meal) while their parents attended courses in nutrition.

The results at the end of the year were impressive. At the start children from low income homes were shy and apathetic, in sharp contrast to the children at the other centre. Yet by the end of the experiment the two groups had attained almost the same level. One first-grade teacher observed that the four children in her class who had attended the pilot centre were more alert, mature and active; they adjusted more easily, and became "star pupils" in the class.

The parents were equally enthusiastic, and in response to their demand for more pre-school facilities, eleven centres have been set up in the low income areas, each catering to 15 children. The centres are staffed by girls from the neighbourhood who have been trained for the job. Each centre has the same objectives: to provide the child a variety of mental, physical and interpersonal stimuli; to include nutritional components in the



The pre-school centres are under the direction of local girls. In addition to classroom activities, all the children receive a high-protein meal of mixed vegetables.

children's meals; and to offer parents educational courses in nutrition.

It is perhaps significant that the National Department of Planning, on learning of the results attained in the pilot centres, approached the ICA and offered to finance both the initial training period, and the first full year of operation. An evaluation system is now in preparation to follow up on the future progress of each child.

The centres will also provide a base for further research on the effects of malnutrition and how they can be avoided. Through careful analysis of the children at each centre researchers hope to establish whether or not there is a link between vitamin A deficiency and a child's visual inattentiveness or lack of concentration. A positive result would at least partly explain slow learning in primary school, and if the deficiency should prove reversible in a short period, the supply of vitamin A supplement could become a key activity within rural development programs.

The study on family nutrition also led to another study that has produced some surprising preliminary results. Using the data obtained the project's researchers have calculated that the average family could obtain the minimum basic nutritional requirements at a cost of approximately half what they are presently spending per capita per day, simply by reorganizing their diet. Although the researchers are still cautious, they admit the results are encouraging, and if borne out in future studies can only lead to the conclusion that a proper nutritious diet is within the reach of the poor without prior need for an increased income.

Perhaps most encouraging of all, however, is the enthusiasm of the people themselves for the household management program once its objectives became clear. It is this enthusiasm that has led to the program becoming a truly relevant part of the overall project.

Awards program gets young scientists involved

Michelle Hibler, information officer with the IDRC's Publications Division, recently visited several Southeast Asian countries. The following articles deal with two pressing problems in the region – population and housing.

With an expansive gesture Dr Kernial Sandhu synthesizes the Southeast Asia Population Research Award Program, of which he is chairman. "It's a way of spreading the good word around," he says, a spread that is both geographical and disciplinary.

Traditionally led by the medical profession, population research has tended to emphasize fertility control. Dr Sandhu sees this as one of the main reasons why population programs in Southeast Asia have not shown results in proportion to the money invested in them. And this imbalance, he explains, is one of the fundamental points of SEAPRAP, which seeks to involve young social scientists in the study of broader population issues.

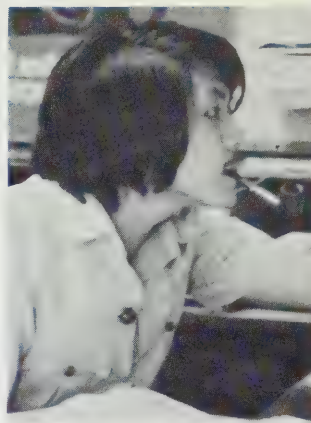
The program also aims at correcting another imbalance – the dependance of Southeast Asia on population research undertaken by and in developed countries.

Bristling with coloured pins a wall map summarizes the first two years' achievements: 23 grants awarded to young researchers in five countries. There is a pattern to the pins. The reds studding Indonesia and the Philippines indicate a concentration of research on the psychological, social and economic factors affecting the national family planning programs. In Thailand, blues and greens show a greater interest in migration and urbanization issues and in the various factors affecting and affected by population growth.

Most of the research proposals are policy oriented, ranging in concern from the impact of rapid population growth on landlessness and rural poverty in Thailand to the influence of local leaders' attitudes on family planning services in Malaysia.

Meeting in Singapore in October to review the program's progress and plan its future, members of the SEAPRAP committee approved a further seven awards and formulated a publications policy that will encourage local publication, in the researcher's own language, of the research results.

Below, three awardees share some thoughts on their projects.



**'It does get a
little complicated
at times . . .'**

Fong Kwok Yuen is Assistant Secretary in the Economic Planning Unit of the Prime Minister's Department in Kuala Lumpur, Malaysia. When complete his research project – a micro-model of demographic-economic behaviour – will be the first such analysis in Malaysia.

"The Second Malaysia Plan has among its objectives to raise income levels and increase employment for all Malaysians. It therefore becomes important for programs and policies, including population policies, to be related to these equity objectives.

"Essentially what we are trying to do is look at the household from the point of view of both production and consumption. Take the housewife for example. She could offer her services in the market, or she has the alternative of spending her time at home taking care of the children and producing what services could be required by the household. We think this kind of decision is a crucial factor in helping her to decide how many children she will have.

"Using data for 27,000 families, taken from the 1970 Post-Enumeration Survey, we are trying to look not only at the number of children she will have, but we are trying to relate that to whether she will use contraceptives. This in turn will be related to the educational variables, where the person lives, her income and her husband's income, and so forth.

"In Malaysia there is an explicit target to come at a two percent growth rate by 1985. We try to see if this target is feasible, and if it is not feasible, what are the problem areas. Is it a matter of acceptance? Or the types of services that we supply? Or is it a matter of non-family planning variables?

"The study is actually descriptive, it looks at the data to see what relationships can be discerned – but it can also have its uses in policy-making. If, for example, it is known that, by and large, the households with a large number of children are the poor households, then this might be construed as the need to supply better or cheaper family planning services.

"Or, as is the case now, you see income being inversely related to the number of children in the household. But the relationship, when it becomes more fully entangled, could very well show that, when you allow for education, income and the number of children are actually positively related and what is affecting it is education in the end.

"And so, if this is found to be true, it's kind of senseless to say that all you have to do is to take care of the people – give them higher levels of income – and the population problem will take care of itself.

"It might seem pretty simple to go ahead with a project like this, but actually when you look at the multiplicity of relationships that could exist – trying to find the chicken-and-egg sort of relationship – it does get a little complicated at times."



'You can't go door to door and say: buy this . . .'

Mrs Pavala Gopinathan, a social worker, has worked with the Tamil-speaking community in Singapore for five years. Her study of 'Intervention intensity and family planning behaviour' was prompted by the apparent inability of the family planning program to reach this group of families.

"If I had my way I would do what I can for all 80 families that I am studying, but I have to turn my back on one group because what I am trying to prove is what happens to families when you intervene and what happens when you don't at all.

"I have three groups. The families that have intensive intervention, they have help from me in all the smallest areas because I realize that getting them to organize their days wouldn't make it so difficult to think about going to the family planning clinic. In every area I would sort of be on their backs telling them what to do, taking them by the hand. In the medium intervention what I do with the women is I say 'Too bad. Now what can you do?' And I tell her where she can go for help, but I don't go with her.

"The third group, I leave them alone. I don't even tell them to think about their problems.

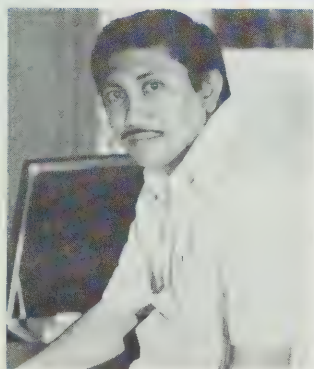
"I feel family planning is a very personal matter. You can't go door to door and say 'Buy this'. So they buy it, just like they would buy a box of soap – to get rid of you – then they chuck it. And all the statistics say they're acceptors.

"When you talk about acceptance, about the two children, who are the two children families? It's not these low income people. You find it's very difficult to reach these people. The disincentive measures have no effect on them because they don't look at it as something that's supposed to help them. Some of them believe that children is the only thing they have control over. It's very subjective reactions than can only be dealt with at the personal level. And that's what I'm trying to prove. And I am going to make my point because I can see results even now: families that I help respond, families that I don't help just carry on as before.

"What they need is someone to explain to them. But no one goes out to explain unless they go to the clinic or the nurse is doing her rounds, but even then, half the time she doesn't speak Tamil. And she doesn't know how to approach these people. The doctor can't, he deals with it solely as a medical problem and it's a social problem, a personal one.

"Even with me it's not easy. I build up a relationship with them over a long period – I call it a relationship from the door to the kitchen. By the time I reach the kitchen I'm ready to talk to them about family planning because I have shown them that I care about more than just limiting their family. And this is another thing I want: to create in social workers an awareness about family planning.

"Maybe not every family in Singapore can get what I'm trying to do, but if only they were given more help I could quite safely say that 100 percent of my families would be acceptors."



'The ideal number of children was five or six . . .'

An economist, Drs. Agus Salim is director of demographic research at the Universitas Syiah Kuala in Banda Aceh, Indonesia. He is presently compiling the results of the fertility and KP (demographer's jargon for knowledge and practice) family planning survey he conducted in three isolated Aceh villages.

"The family planning program in Aceh started in April 1974 but most of the people do not know about it. I want to show to the people here about our fertility and KP of family planning, so I chose the three village types in the district of Aceh Utara – a farming village, a fishing village and a mixed village.

"I used 10 interviewers, all female students. We started in June to go to Lho' Seumawe which is a mixed village. At first the people were scared of us, but after we asked the head of the village to accompany us to interview, they accepted us. We asked questions about fertility, mar-

riage and divorce, family planning, mortality and about variables such as food consumption, occupation, contact with others. In all we took 15 days in the field.

"In the fishing village most of the people did not agree with the program, and in fact, 100 percent of them never used contraception.

"According to the villagers, it is contrary to the Islamic religion. The data shows it is because of bad communications: they never read the newspaper or magazine, and because of the low social condition they have no radio so they did not know the information. When we asked them 'what about the future?', 26 percent answered that they will use contraception now that they had heard about it from us.

"In the farming village 50-50 had heard about the program and 50-50 too, agreed. In the mixed village about 72 percent had heard.

"We found a paradox in the field: even if they agreed with the program, the ideal number of children was more than five or six. I don't know why, but maybe they still do not understand about the meaning of the program.

"Some of the people in Aceh think that a family planning program is not necessary yet because the population is only two million and the annual growth rate is only 2.1 percent. I think we have to start from now to make the rate of growth still lower.

"Because of the development of education some of the young people come to the city from the countryside and after they finish their studies, the demand for them is little. Unemployment is a problem at this time. So how will it be in the future if the rate of growth of the population does not lessen or stay at two percent?"



Photo: Michelle Hibler

The staggering statistics of housing

As their jagged skylines intimate, in Hong Kong as in Singapore, low-cost housing equals high-rise buildings. Extensive urban renewal and public housing programs have made both city-states leaders in the field of urban housing. But as reports from the Southeast Asia Low-Cost Housing Study Project reveal, these programs are not readily applicable to other countries more recently engaged in the struggle of housing their expanding populations.

Urbanization appears as the greatest single factor responsible both for the success of Singapore's and Hong Kong's programs and for the dilemma with which Indonesia, Laos, Malaysia, the Philippines, Sri Lanka and Thailand are now confronted. Relatively small, both Hong Kong and Singapore were highly urbanized when their housing policies were implemented. Rapidly-growing export-based economies and the absence of vast undeveloped hinterlands allowed massive investments in the housing sector, investments not likely to be duplicated by other Asian countries faced with the formidable task of upgrading their rural regions.

Now complete, the individual country studies that began in 1973 put forth some staggering statistics: between 1972 and 1983 Jakarta will require an additional 1.2 million houses; Sri Lanka's annual housing requirements during the same decade will be 125,000 houses. In the Philippines the combined rural and urban housing need ranges from 266,000 to 447,000 units — 6.4 dwelling units for every 1,000 people — every year until the year 2000. At present less than three units per thousand population are being constructed, 85 percent of which are affordable only by families in the upper 12 percent income range.

High natural population growth combined with a heavy rural to urban migration are resulting in urban population growth rates often double the national one. In the absence of a similar economic growth rate, the consequences of this accelerating urban growth are highly visible — low levels of industrial output, high unemployment and underemployment, poverty and income inequality, an increasingly inadequate infrastructure and transport facilities, mushrooming slums and squatter settlements.

The Thai National Statistics Office estimates at 600,000 the number of squatter and slum dwellers in metropolitan Bangkok, for example. Crowded at a density of 100 per acre, less than 2 percent of the residents of Klong Toey slum have access to piped water; almost 70 percent of the 30,000 inhabitants must buy their water at exorbitant prices from water vendors, a burden on family incomes which are little more than half the average income for Bangkok residents. And the situation is much the same in other large Asian cities.

The urgency of the problem has prompted administrative reorganization and new policy formulation in a number of Southeast Asian governments. Most policies have however failed to reverse the trend to overcrowding, substandard dwellings, expanding slums.

The comparative reports of the study, discussed at a meeting of the Southeast Asia Low-Cost Housing Study Group held in October 1975 in Pattaya, Thailand, point to the difficulty experienced by policy-makers in understanding the causes of the housing problems as the root of this ineffectiveness. Unrealistically high standards set for housing units combined with limited financial resources have

resulted not only in insufficient construction but also in price tags beyond the reach of the poorer 40 percent of the population. The refusal to accept low-standard housing, even as an interim solution, often leads to a cycle of demolition and construction. Resettlement schemes, sometimes pushing the urban poor to ever-distant peripheries, ignore the lifestyles and work places of those relocated.

To be published by the IDRC next year, the comparative studies indicate that public housing programs such as Singapore's are not the only solution to urban squatting and slum expansion. Nor do high-rise buildings necessarily result in saving on spiraling land and materials costs. "In the majority of countries conditions are much worse than they need be," says Stephen Yeh, project coordinator. Buried under cumulative statistics of housing deficits, policy-makers often by-pass alternative approaches that could reduce health and safety hazards while contributing to a positive urbanization strategy.

The reports also point out that effective housing policies cannot exist independently of policies dealing with urban development, population growth, internal migration and the planning of new growth centres.

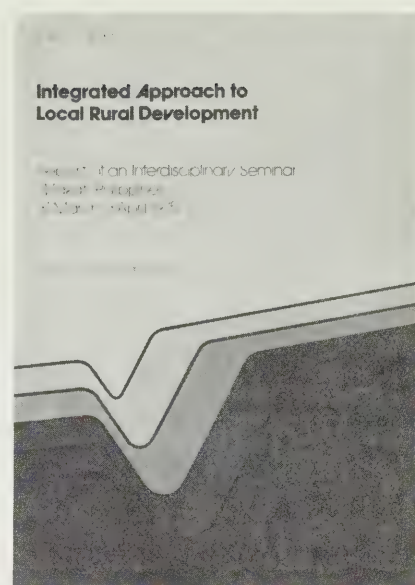
The usefulness of the low-cost housing studies is already apparent: the Hong Kong study has been recommended as basic reading for the Housing Management course offered by the University of Hong Kong and serves as a background manual for the newly formed Housing Department. The first of their kind in the eight countries studied, these monographs are benchmark studies that go beyond being mere indicators of need to become imperatives for action.

Michelle Hibler

New publications

THE INTERNATIONAL EXCHANGE AND TESTING OF CASSAVA GERM PLASM, Barry Nestel and Reginald MacIntyre, editors. Published September 1975, 74 pages, IDRC-049e. Microfiche edition \$1.

This is the seventh IDRC report relating to cassava. It covers the proceedings of an interdisciplinary workshop held in Colombia in February 1975, attended by scientists from Colombia, Peru, Guatemala, Ecuador, Venezuela, Brazil, Indonesia, Malaysia, Philippines, Thailand and India. In addition to a summary of the general discussion and conclusions of the workshop, the report includes presentations by all the participating countries, and six theme papers on various aspects of the central topic.



INTEGRATED APPROACH TO LOCAL RURAL DEVELOPMENT, Marilyn Campbell, editor. Published October 1975, 52 pages, IDRC-051e. Microfiche edition \$1.

This is a report on an interdisciplinary seminar sponsored by the IDRC and hosted by the Nutrition Center of the Philippines in April 1975. Representatives of Bangladesh, Malaysia, Thailand, Indonesia, Philippines, Korea, Papua New Guinea, Colombia and ESCAP of the United Nations took part. The report contains 12 papers on rural development, a review of various governments' policies on rural development, a summary of the session on potentials for regional cooperation, and a list of the participants' recommendations.

POPULATION AND HEALTH, published October 1975, 15 pages, IDRC 046e (édition française IDRC-046f). Microfiche edition \$1.

First of a series of booklets under the collective sub-title "IDRC Program Directions," the purpose of which is to provide some basic information about the Centre's various program divisions. This one describes the objectives, priorities and operation of the Population and Health Sciences Division, and gives some examples of the research projects undertaken. The booklet is illustrated with black-and-white photographs.

IRRINEWS, Newsletter of the International Irrigation Information Centre, issue No. 1 published October 1975.

This IDRC-supported Centre is intended to serve as a focal point for workers in the field of irrigation and to "increase the professional identity of the irrigationist." The newsletter, which will be published on a regular basis, is one of several functions of the new Centre, and will serve "first and foremost as a keep-in-contact medium for the profession."

THE SCIENCE AND TECHNOLOGY POLICY INSTRUMENTS PROJECT, published November 1975, 12 pages, IDRC-050e.

The STPI project, jointly sponsored by the IDRC and the Organization of American States, is one of the largest projects ever organized in the field of science and technology policy research. This booklet outlines the background and approach to the project and explains its objectives, organization and structure.

TROPICAL OYSTER CULTURE: A SELECTED BIBLIOGRAPHY, by D. B. Quayle. Published October 1975, 40 pages, IDRC-052e. Microfiche edition \$1.

Prepared for the IDRC by Dr Quayle, one of the leading figures in oyster research, this bibliography contains some 267 references, from general publications to highly specialized papers. While not intended as an exhaustive study, it is meant to provide a basis for a more relevant bibliography for any particular area of the world.

For information on how to obtain these or other publications, see notice on back cover.



FAMILY PLANNING IN MALI, by André Laplante, Faran Samaké and George F. Brown. Published September 1975, 12 pages, IDRC-045e (édition française IDRC-045f). Microfiche edition \$1.

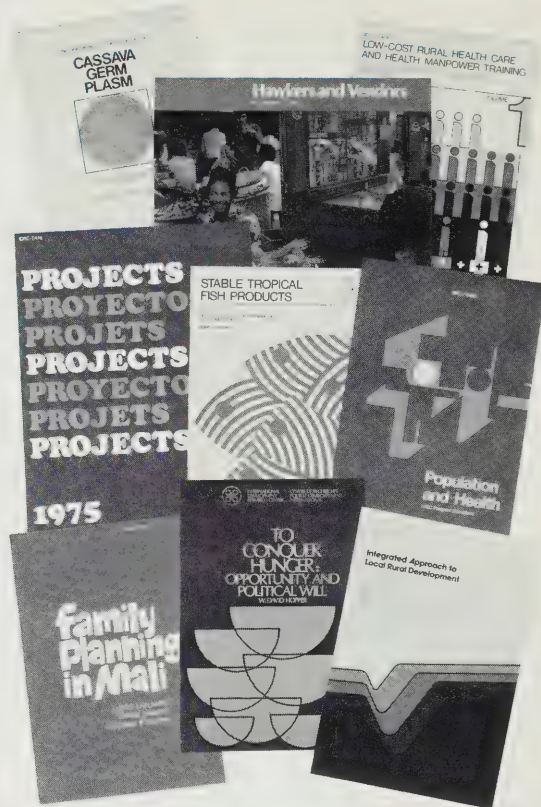
This booklet describes the background and implementation of a unique experiment in family planning. Mali became the first francophone African country to officially recognize the need for family planning programs when it began a two-year pilot project in cooperation with the IDRC, and is now deeply committed to an integrated national program. The authors are, respectively: the former IDRC resident research advisor in Mali, the Director of the Association Malienne pour la Protection et la Promotion de la Famille, and the Director of the IDRC's Population and Health Sciences Division. The booklet is illustrated with black-and-white photographs, and contains statistical data on the project.



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Reports

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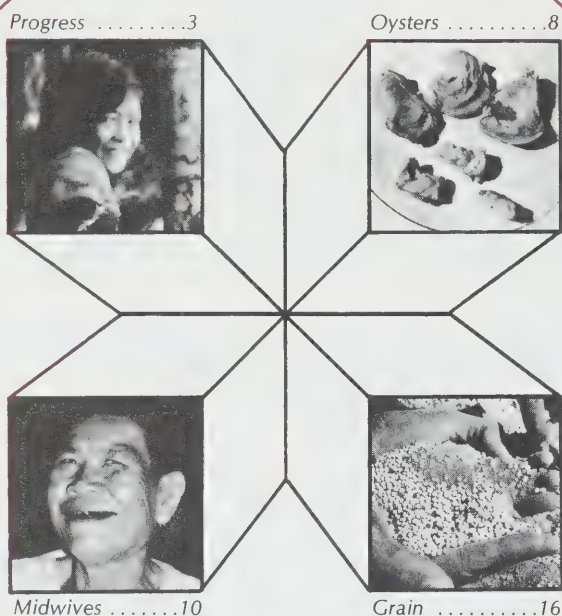
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Government
Publications

Rural Development: The Challenge of Change



Reports



CONTENTS

'Good roads make it easier to receive new ideas'

Report on rural modernization and change in Africa and Asia, by Michelle Hibler 3

Human Resources

Clyde Sanger talks with a young Latin American scientist on one of the world's last frontiers 6

Potatoes are good for you...

Peru's International Potato Centre wants all the world to have potatoes, by Bob Stanley 7

Oysters not a luxury in West Africa

Bob Stanley reports on an oysterculture project just getting under way in Sierra Leone 8

Thailand's traditional midwives

Photo feature on a new film available from IDRC 10

Briefs

People, projects, events 12

Regional News

Reports from IDRC's Regional Offices in Singapore and Bogota 13

Cropping systems for small farmers

Improving the lot of small landholders in Indonesia, report by Michelle Hibler 14

Grain preservation — cutting the food losses

Project in Senegal combines the best of traditional and modern methods, report by Bob Stanley 16

Universities collaborate on new project

John Friesen reports on a new fertility research project involving three Asian universities 18

New publications 19

The IDRC Reports, a magazine about the work of the International Development Research Centre and related activities in the field of international development, is published quarterly at the Centre's head office, and is available on request from the Publications Division.

Established in 1970 by Act of the Canadian Parliament, the Centre is a public corporation supporting research designed to adapt science and technology to the specific needs of developing countries, and concentrating in the following fields: Agriculture, Food and Nutrition Sciences; Population and Health Sciences; Social Sciences and Human Resources; and Information Sciences.

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Good roads make it easier to receive new ideas



by Michelle Hibler

Kassim Bin Onar, like most family heads in the small north-west Malaysian village of Paya Keladi, is a rice grower and part-time rubber tapper. His three children attend the English language school in a nearby town. It is partly to ensure their education, Kassim says, that he has implemented many changes during the last nine years: the three relongs of land — approximately two acres — he rents from the Province Wellesley Cooperative Banking Union have been planted to the high-yielding Apollo rice variety and since the completion of the Penang Tunggal Pumping Scheme in 1966 he has practiced double cropping.

But although these improvements in his farming methods have increased his yields significantly, he says, his production costs have similarly increased. The fertilizers he must buy from middlemen are expensive, as is the rental of tractors and buffaloes to prepare the land. And although his wife helps in the fields, it is not enough, so he must hire labourers during planting and harvesting.

During the last two decades Kassim Bin Onar and the millions of small farmers like him who make up over 80 percent of the population of developing countries have been the target of numerous development strategies and programs. There can be little doubt that these efforts to induce change in the rural sector have met with some success.

In the wake of the Green Revolution, agricultural production programs have reached millions of smallholders and increased food production at the farm level; in a number of countries such as Korea and Kenya, self-help and community development schemes have led to the construction of much-needed

schools, clinics and infrastructure; administrative reorganizations in the newly sovereign states have fostered local participation in the implementation of development programs.

Yet rural development has not occurred as rapidly as the most optimistic planners had once hoped and development programs have reaped reproach as well as praise. Some critics maintain that small farmers such as Kassim have not yet enjoyed social benefits proportional to technical improvements and that the objectives of local development groups and national planners have often been at variance, resulting in some duplication and frustration of efforts. All of this has however been said without much evidence or factual support.

Responding to the need for increased information, the IDRC is supporting a number of projects in Asia and Africa which examine the processes of modernization and change and their impact on the lives of rural peoples. In Indonesia and Malaysia, a project aims at assessing the effects of technological change on rural communities. A smaller now completed study in Central Java looks at the factors affecting, and affected by, the implementation of one such change — irrigation systems.

In Africa two projects being supported by the Centre focus on political and Institutional modernization. In Kenya researchers are now starting to study ways in which greater cooperation can be achieved between central government planners and people taking initiatives at the local level. In Nigeria, a research team from the University of Nigeria at Nsukka has recently completed an assessment of new forms of local government being tried in South Eastern State and East Central State.

Although the focus of these projects varies, together they form a network that should lead to a better understanding of

the many processes involved in the modernization of rural areas.

The first of these projects, carried out in Malaysian and Indonesian villages, is now nearing completion. Concerned about the apparent gap between technical and social progress in both countries, the Universiti Sains Malaysia in Penang, Malaysia, and the Universitas Sjah Kuala in Banda Aceh, Indonesia, in cooperation with Laval University of Canada, launched a study of the social impact of technical and agricultural changes at the village and household level. This study also aimed at assessing the role played by government aid in the distribution of technical change and social benefits.

Facing one another across the Malacca Strait, the regions chosen for the study — the states of Penang, Perlis and Kedah in Malaysia and the Province of Aceh in Indonesia — shared a common background stemming from the rule of the Sultan Iskandar Muda in the 16th Century and similar economies based predominantly on rice and rubber cultivation. In Malaysia however, numerous government agencies had since the 1950s assured the wide spread of technological changes. Through these agencies education and health facilities, irrigation and infrastructure have also been provided.

Location and a long history of wars had, on the other hand, virtually isolated the Province of Aceh from the rest of Indonesia. Only in the mid 1960s did the development of the region begin with the upgrading of the road linking the provincial capital of Banda Aceh to the Sumatran port of Medan, a distance of 500 kilometres necessitating four grueling days travel. As Dr Ibrahim Hassan, rector of Sjah Kuala University and one of the project coordinators puts it: "Good roads make it easier to receive and accept new ideas".

Not surprisingly, the study shows that



Children at Paya Keladi — the changes may ensure a good education .

Achinese villages are less economically developed than their Malaysian counterparts. In fact, the 32 villages studied in both locations present a continuum of development, from the least to the most progressive.

While preliminary, the findings suggest that although strides have been made in both social and technical progress, in some cases social progress has lagged behind technical improvements. This is not to say — as some critics have maintained — that technological change has increased social inequities. Rather, as in an earlier study on the impact of rice farming changes carried out under the coordination of the International Rice Research Institute in six Asian countries, the findings point to the conclusion that technological innovations alone cannot correct serious inequities when centuries had failed to do so. What is important in the context of this study is the farmer's gains relative to his situation before the advent of the new technology — and the majority of villagers in both Malaysia and Indonesia affirmed that they were indeed better off.

In the Malaysian village of Paya Keladi, for example, three young villagers were able, last year, to undertake post-secondary studies and many villagers can now afford radios, bicycles and other consumer goods. In many Achinese villages new meeting and prayer houses have been built, paid for, they say proudly, on a crop-share basis, a luxury they could not have afforded a few years ago.

The findings further indicate that the gap between technical and social progress is not uniform in the villages studied. Despite Aceh's lower levels of progress and of government aid, the researchers found that social progress was proportionately higher here than in Malaysia. Achinese children, for example, attained

the same educational level as Malay children, in spite of Malaysia's higher level of economic growth. It further appeared that progress and aid were more evenly distributed in Aceh, both between and within villages.

A surprising preliminary finding, and one that the researchers feel warrants further investigation, is that no definite conclusion can be drawn about the role of government aid in either the spread of technical innovations or in the equal distribution of social progress. An important determinant of the farmer's level of technical and social progress is the village in which he lives.

Similar conclusions about the village's central role in the acceptance and implementation of change emerged from a more specific study of the role of irrigation systems in Central Java. Now completed, this second project further points to the complexity of the factors involved in the change process and to the need for selective adoption of traditional methods as well as the adaptation of new approaches to suit existing conditions.

Irrigation in rice farming communities is more than mere technology: at the base of community survival, it is woven inextricably into the social, political and cultural institutions of the villages. In Central Java three main systems have evolved through the centuries to meet the changing needs of the communities. However with the advent of the Dutch colonial period of compulsory cultivation of cash crops such as sugar cane, and the construction of large irrigation networks which removed water control from the villages' jurisdiction, the traditional values of cooperation and mutual help on which the systems' management depended were eroded by growing commercialism. There resulted a neglect of the irrigation channels, disputes over water distribution and the rise of large landholders with power to appropriate water.

In efforts to intensify agricultural production, the Government of Central Java introduced a new system in 1971. Beginning their study at the end of the system's introductory phase, the research team from Satya Wacana Christian University soon recognized that the problems impeding the operation and management of the existing traditional systems would not be solved by the introduction of the new one. In fact, if the new system was to be successful, its implementation would need to be accompanied by measures aimed at improving the overall village situation.

Most important were the need for greater coordination between the various government agencies responsible for irrigation and agricultural production and land and political reform in the villages. The researchers concluded that the new system would need to adapt itself to each village situation and that, above all, its implementation



Achinese villagers on the steps of the prayer house paid for in crop-shares.

would need to be gradually and carefully undertaken in consultation with, and with the full participation of the villagers it would affect.

Researchers and policy-makers alike have long agreed that national progress should be grounded on the dynamism and active mobilization of human resources at the grass-roots level, a view that was reiterated at an IDRC-supported seminar on integrated rural development, held in the Philippines in 1975. But how do countries generate local initiatives and mobilize local resources for development plans that accord with national development priorities? Decentralization of decision-making and the involvement of the local population in the planning process are advocated by some as a means to move rural development forward. Reconciling local and national goals in this decentralization process is not however always easily accomplished.

In Kenya, for example, following independence in 1963, *harambee* (self-help) groups sprang up throughout the agricultural areas. Adapted from the traditional work parties, *harambee* groups worked communally for community projects which they initiated in consultation with the village chiefs and community development staff.

Support for this local development initiative has been more than enthusiastic. By 1974 the local impetus had generated investments totalling over \$20 million in rural programs, including more than 250 health centres, 700 secondary schools and village polytechnics and 17 institutes of technology. The value of contributions in labour and materials during the 1967-72 period was estimated at more than \$40 million.

Policy-makers soon realized, however, that a number of the locally in-

initiated projects tended to be out of line with nationally planned policies and goals and were begun with false expectations of government aid. Pilot studies carried out in 1971 by the Institute of Development Studies of the University of Nairobi, at the request of the government, revealed that the central government agencies were generally unprepared to cope with the dynamic local initiatives and that, for their part, harambee groups were not inclined to support central government plans that did not accord with their own priorities.

A systematic study of rural development management, focussing on ways in which cooperation can be achieved between central government planners and local initiative groups is now beginning. This study will not only analyze the deployment of local resources in rural development but also aims at recommending ways in which the planning and implementation of development projects in Kenya can be more effectively decentralized.

This harmonizing of the people's efforts in the development process can not only mobilize greater resources but also link economic development with the dynamics of social-political change. The problem of what kinds of institutions and leadership can best achieve these aims and ease the process of modernization and change is one that has long concerned Nigerian authorities.

During colonial times the British relied heavily on indirect rule through chiefs and native authority councils. After independence, attempts were made by Nigerian authorities to adapt the structures: in East Central State, the two-tiered Division of Administration system was introduced, while in South Eastern State, Development Administration Areas were created. Through these new systems it was hoped that the government would be brought nearer to the people and would involve them at the grass-roots level in a reliable and constructive development of their areas.

In 1973 researchers from the University of Nigeria at Nsukka set out to inquire into the workings of the new systems. Often travelling to the villages on foot or by canoe, the team sought answers to such questions as: Can attachment to traditional political structures go hand in hand with acceptance of modern change? What is the relationship between the rural leaders' acceptance of change and their education? How do communities adapt changes to existing structures? How does over-centralization affect rural development?

The researchers found that the strong attachment to traditional political structures in the villages was, at times, slowing down the development of agriculture and industry. Village government in South Eastern State, for example, involved the maintenance of law and order and the development of local



The majority of the villagers affirmed that they were indeed better off.

infrastructure. Agriculture and industry were considered to be individual endeavours. While the central government recognized and provided for the development of these latter sectors, structural problems affected their realization. During 1973-74, less than four percent of the expenditures for development programs had been spent on agriculture and industry and most projects had been initiated by village leaders rather than by the new councils empowered to do so.

Traditional leaders also appeared to be excluded from decision-making in the new structures, giving rise to conflicts over the promotion of social and economic development. There resulted an ineffective utilization of community resources.

Another major finding was that a lack of coordination between field staff and higher ministries had led the government to ignore an essential part of its role in development efforts — the use of

its field structures and personnel to generate participatory responsiveness of local people to new ideas. In most areas — education, health, social welfare, trade and cooperatives — administrative constraints hindered progress: field staff were too few and insufficiently trained; support services and incentives were lacking; funds were in short supply; communications were poor.

Based on the exhaustive study, a set of practical recommendations has been presented to the government. Some of the problems have already been solved. In South Eastern State, for example, chiefs have been graded into four groups, each with specific functions in harmony with the new local councils. In East Central State, the role of the Divisional Councils has been changed from advisory to executive and more financial autonomy has been granted.

The researchers consider that the project findings have already contributed to a better understanding of the problems in the field and to their resolution. The findings, they say, may also be applicable to the other Nigerian States now in search of new local government structures and institutions that would facilitate the planning process.

These four studies and others being supported by the Centre in Korea and the Philippines, are providing factual information about the processes of modernization and change. While the findings may have immediate, practical applications in the countries concerned, they also point out that no one solution is universally applicable to the problems of rural development. Their greatest benefit may, in fact, lie in outlining a number of alternative approaches from which policy-makers can choose the most appropriate to their particular needs.

Equally important is the strengthening of social science research within these countries and the building of a network of relationships among scientists concerned with similar problems.



Nigeria — how do communities adapt changes to existing structures?

South America's inland plain: one of the world's last frontiers

There are only a few thinly populated frontiers left in the world, and most of them are in frozen or arid corners, like the Canadian North or the Empty Quarter of Arabia. One green exception is the great inland plain of tropical South America, and not surprisingly many people have speculated on its potential for food production in a hungry world.

Not so many people, however, have gone into those parts to try to do something about that potential. Only the most unusual Guyanese, for example, will leave the delights of Georgetown and the coast for the more frugal life of the Interior beyond the forests. But a man like Ken Bovell, farm manager of St Ignatius government breeding station in the Rupununi, has never regretted moving up from the coast back in 1961. Standing among his Santa Gertrudis and Brahman bulls, he explained:

"When you get out on the range and see those mountains, and the cattle there and the Amerindians on their horses, you feel something different. I can't well describe it".

In Colombia, too, there are men of the same spirit. Colombia has some 20 million hectares of savannah country "east of the Andes and west of nowhere", as a naturalist described it years ago. But things are changing. During the 1960s about 100,000 people migrated from higher ground, mainly to the piedmont area around Villavicencio but dozens of more adventurous souls pushed on southwest across the floodplains and along the rivers to establish farms and small ranches. A few years after them came the research stations.

The station at La Libertad, run by the Instituto Colombiano Agropecuario (ICA), is on the good road close to Villavicencio in the area of high rainfall. The scientists there can cheerfully report that rice production in this piedmont area has quadrupled in four years.

At Carimagua the problems are tougher. The rainfall is still good at about 80 inches — in fact, it is too wet for wheat. But the soil is acid and low in phosphorus and lime and high in aluminum content. It is 400 kilometres, or eight hours' driving, over bad roads to Villavicencio; so the cost of trucking in lime and soil nutrients is high. There is also the problem of the dry period from November to April, when the north-east wind blows from the Orinoco basin and the land is parched and the cattle quickly lose weight.

In 1970 the ICA, which holds 23,000 hectares at Carimagua, invited the International Centre for Tropical Agriculture (CIAT) to take part in experiments there. Among the CIAT scientists who arrived during 1973 was Guido Delgadillo, who had spent eight years working on pasture and forage problems in his native Bolivia.

You have to be rather special to survive in the isolation of Carimagua: either a character like Dario, who chases armadillos at breakneck speed in his jeep

and knows when the parrots have laid their eggs in the soft upper trunks of the moriche palm; or someone utterly dedicated to his work like Guido.

His interest has been on increasing beef production through improved pasture. Early results are impressive. Normal production on natural savannah varies between 20 and 40 kilograms of beef per hectare a year; at Carimagua they have achieved, in experimental conditions, 150 kg per hectare. Molasses grass, originally from Africa, has provided good yields. But there is more excitement about the possibilities of stylosanthes, a legume with a yellow flower that is indigenous to Latin America.

Until recently most of the research on stylosanthes has been done by Australians, who first picked it up in 1948 in Brazil (where it was regarded as a weed) and developed it for pasture in Queensland. Among those Australian pioneers was Dr Bert Grof, who came to CIAT in 1971 and is working at Cali on improved varieties of stylosanthes for Colombian soils — they have collected more than 200 varieties for testing. To make sure the tests in the glasshouse pots at Cali are relevant to the trials out at Carimagua, soil from the Llanos has been trucked over the mountain roads to Cali.

Guido Delgadillo is now at Macdonald College in Montreal as an IDRC Research Associate doing his course work for a Ph.D. His subject is the efficiency of phosphorus utilization by indigenous forage species adapted to the lateritic soils (oxisol and ultisol) of the Llanos. In March he was watching his seeds — mostly his beloved stylosanthes, but some grasses also like *Brachiaria* and *Andropogon* — sprout in the growth chambers at Macdonald, experimenting with pH levels and checking their growth rates.

The winter in Montreal he says he has loved: it is not so different in climate from his hometown, Oruro. Though he would like to see something of the Olympics, he doubts whether he will have much time. He has so much to do in the short months before he heads back to Carimagua.

Guido Delgadillo: so much to do.

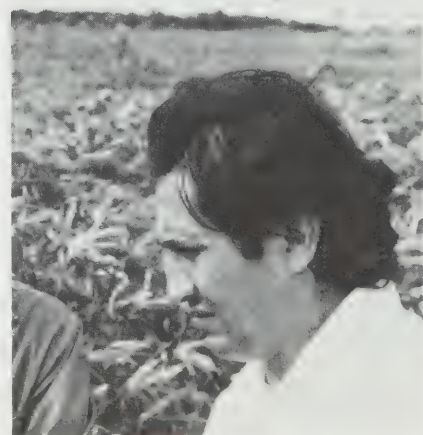


Photo: Clyde Sanger

Potatoes are good for you but how to keep them that way?

Bob Stanley

At the end of the summer the hill farmers of the Andean region of South America spread their potato crop on the open ground and leave it there, exposed to the sun by day and the frost by night. Occasionally they trample on it to help squeeze out the moisture, and at the end of two-to-three weeks they have something called chuno — a dehydrated potato product that could well be the original “instant potato”.

The making of chuno is just one of a number of traditional techniques for preserving potatoes that is currently being studied by food scientists and technicians from the International Potato Centre in Peru. Their aim: to find a simple, economical method of processing potatoes in order to make them available as a valuable additional food source for the developing countries of the lowland tropics. Established five years ago, the Centre has two principal objectives — to increase the yielding capacity and efficiency of production in the developing countries where the potato is already being grown, and secondly to increase the ecological region of adaptability of the potato, including the heavily populated lowland tropical regions. One of its first activities was to establish an outreach program, bringing together a network of regional centres to gather information, to spread the results of research and to provide training opportunities for young scientists.

Such a network is well justified. The potato ranks along with wheat, rice and maize as one of the world's four major food crops. However, it owes this prominent position mainly to its popularity and intensive development in the northern temperate zone, and plays only a minor role as a source of food in the tropics.

Another of the Centre's early accomplishments has been to destroy many of the common myths about the potato — regarded by many as a source of carbohydrates and very little else. In fact, say the Centre's researchers, comparisons have shown that the potato consistently produces a higher average yield of calories, proteins and many vitamins and minerals than the other major cereal, root and tuber crops. Furthermore, say the CIP scientists, the quality of potato protein is generally superior to many other plant proteins, and it seems likely there is sufficient genetic variability to selectively develop varieties with both improved protein quality and increased protein content.

At present about half the people living in the developing countries of the tropics live in areas where the potato grows well. It may also be possible to develop new varieties that will adapt to the lowland tropical areas where at present potatoes do not perform well. This would add enormously to the potato's potential as a much-needed additional source of food in the tropical world.

These facts, says the CIP's Director General, Dr R. L. Sawyer, strongly argue for support of a concerted effort to increase potato production in the developing countries of the tropical world.

There is one major limiting factor, however, and that is the nature of the potato itself. Even in temperate zones the problems of storing, transporting and marketing potatoes are considerable, and result in great seasonal fluctuations in price. In the hotter, humid tropical lowlands these problems become almost insurmountable, making the potato a luxury item in such regions.

Solutions such as the construction of refrigerated storage or expensive Western-style dehydration plants would do little to help the subsistence farmer or the small rural community. What is needed is an inexpensive, practical, low-energy method for dehydrating fresh potatoes in order to ensure a uniform year round supply.

This, in essence, is the aim of the new project being undertaken by the CIP with the support of the IDRC. Over the next two years an all-out effort will be made to find a potato processing method that meets these requirements, without reducing the potato's nutritional value, and which can be adapted from the village-level operation up to a larger-scale commercial production.

Which is where chuno comes into the picture. The Centre's scientists began by examining the traditional methods used by the hill farmers. Unfortunately, while the method of producing chuno is very efficient in preserving potatoes over long periods, the process destroys much of the potato's nutrient value, negating one of the project's basic criteria. This also applies to other traditional products so far tested.

The use of natural elements such as solar energy will be thoroughly investigated, however, perhaps for use both in drying the potatoes, and in heating water to blanch them in order to prevent discoloration. Another of the project's criteria is that the final product must be as acceptable to consumers as are fresh potatoes.

The development of a “super potato” that can survive and flourish in tropical soil conditions will not solve the world's food problems — but it will help. Dr Sawyer puts it this way: “The pressures to feed the rapidly increasing population of the tropical world are already serious and will become more critical. In the search for crops and technology to meet this problem, the potato deserves careful consideration.

“The problems of storing and transporting potatoes, together with unstable annual supply and price structures, must not continue to be the unresolved factors that are currently limiting potato production capacities in developing countries.”

Oysters not a luxury in West Africa

Bob Stanley

Floating on the murky waters of a tidal estuary just outside of Freetown, capital of Sierra Leone, is a raft made of bamboo and oil drums. Beneath the raft on dozens of strings hang several thousand young oysters. Along the coast are other, similar rafts, each carrying the same hidden cargo. They are part of a project which, if it succeeds, could provide a valuable and much needed extra source of protein, not only for the people of Sierra Leone, but for many coastal nations of West Africa.

The Sierra Leone oyster culture project is being carried out by Fisheries Division

of the Ministry of Agriculture and Natural Resources, with the support of the IDRC. Although the project began only 18 months ago, it is already beginning to produce significant results. Yet the first question that strikes a visitor, looking around the estuary, is "Why cultivate oysters?" For the tidal estuaries here are surrounded by mangrove swamps, and on the mangroves grow millions of wild oysters.

Balanced astride the raft as it rolls gently on the incoming tide, Abu Kamara, senior fisheries officer with the Ministry, explains. "Sure the oysters are abundant in the estuaries, but they are generally small and they cluster on the mangrove roots.

"We figured out that the reason why the oysters are so small is because they are crowded, and also because when they grow on the mangroves, at low tide then they are out of the water, which is roughly eight hours a day. The lack of food, the stress of the heat and the crowding contribute to their small size.

"We hope that by growing oysters using the raft method, which we identified in 1974, we will get rapid growth. And the results so far indicate that."

To most people in the Western world the oyster is a luxury food — partly as a result of the destruction of the oyster beds by industrial pollution. But here on the West African coast, as in parts of Asia and the Caribbean, they are seen as an important protein source for the poorest people.

Again Abu Kamara explains: "Fish is the most important source of protein. We have very little cattle activities going on, and this is mostly in the northern pro-

vince. Chicken and poultry is really very, very small. The main source of protein is fish."

"Most of the oysters that are harvested at the moment are wild oysters. But there is no regular supply. The people do it when there is no other work." Across the estuary, two men wade thigh deep in the mud, hacking off the oyster-laden mangrove roots with machetes, and loading them into a dugout canoe. At best it is uncomfortable work.

"The average size of the wild oyster meats", says Kamara, "is between one and two grams, whereas the weight of the raft-grown oysters' meat is between four and five grams in nine months. The wild oysters, we don't know the age for sure, but it is not less than two years".

Once the techniques are fully developed, Kamara hopes the government will consider setting up oyster cooperatives, to raise oysters on a large scale — a single experimental raft at present appears capable of producing around 60 kilos (132 lbs) of oyster meat in six to nine months, and with a minimum of effort. "Once they have the rafts assembled, then all they have to do is lay them out and continue to do something else".

With this in mind the raft design has been kept as simple as possible, making use of locally available materials wherever possible. Kamara estimates the cost of a raft at around 60 Leones (\$63). The main ingredients are the bamboo poles, oil drums, string and a few hundred oyster shells. The shells are suspended from the strings beneath the raft, and provide an ideal surface on which the oyster larvae, drifting in the water, can set and grow.

The rafts, locally built of bamboo and oil drums, can support thousands of oysters below and several men above.



There are problems with the shells however. Their useful lifespan is only about six months, after that they begin to disintegrate, dropping their "passengers" to the mud bottom. Tests are now being conducted to ascertain the optimum growth period for the young oysters. In Japan and Korea plastic discs are used instead of shells, but Kamara is reluctant to switch unless he has to, because the discs are expensive. The shells are free, you just pick them off the beach.

The aim of the project at present is to locate suitable growing sites and study problems such as plankton distribution, fouling, predators, growth cycles. The idea is to avoid problems by picking ideal locations rather than developing costly methods of combatting them. Microscopic tests at regular intervals identify the organisms setting on the surface of the shells. "It could be oysters, it could be algae, it could be tube worms, it could be any other thing. And we study the sequence, and if we come up with a certain frequency, say there is heavy fouling at a time when the young oysters are just setting on the shell's surface, then we will try to avoid that place because it will result in heavy mortalities".

Over the next two years the project will also conduct detailed productivity studies, examine the possible effects of pollution on the growth of oysters, and look at the ancillary aspects of oyster farming, such as improved processing, distribution and marketing.

"At present," says Kamara, "You can buy oysters in the market — depending on the season, the availability and the

demand, but the meat is very expensive. Another reason why people are not utilizing the oysters is because the methods of preparation are often not very hygienic. The oysters have to be steamed, and often times on the shucking (shelling) sites they are left exposed to the flies.

"If we are able to come up with a good successful method of raising and processing the oysters with the kinds of techniques that we are using presently, I think it will contribute considerably in terms of increasing the protein availability in the country. Raising oysters you have control, you know the amount you raise and what to expect provided other things are all favourable. The only thing that will hold them back will be where to sell."

It is too early yet to declare the Sierra Leone project a success — the results so far are only preliminary. But its progress is being closely followed by several other West African coastal nations with abundant wild oyster beds of their own.

Says Kamara: "We should document all our methods, all our mistakes, all our successes, for countries that might be interested in raising oysters. At a later stage we can advise, either by giving them seminars and talks, presenting papers, or actually going there and visit the areas and talk to them about where to grow and how to grow oysters."

The project is also providing on-the-job training for a number of young African scientists, specializing in such aspects as culture systems, sanitation practices, and processing methods. This will add to the available pool of specialized talent in the field.



A picture worth a thousand words: raft oysters at top, wild oysters below.

There is one other aspect to the project. Aquaculture is relatively new in West Africa, where, with the exception of Ghana's man-made Volta Dam lake, there are few large bodies of fresh water. Coastal fishermen have been the traditional providers of fish for the markets. If the oyster culture project is a success, it may have a considerable influence on the future development of fisheries policies throughout the region.

As Abu Kamara puts it: "The whole idea of aquaculture is new in West Africa. In West Africa we are just beginning to learn."

Harvesting wild oysters on the mangroves at low tide — uncomfortable work at best.



"Pâ-noi listens to Nitiya's account of her new job in a rather distant way. She considers that her own role is set in life, and won't change. However, one morning, ..."

Nobody was really asking Pâ-noi, a widow of nearly 60, to change her way of life drastically. She was, as the film's narrative explains, a village midwife living in the plains of central Thailand. She attended the births of perhaps two or three babies every month. "But she was first and foremost a farmer". The film opens with shots of her ploughing the rice-fields with her oxen.

Nitiya, her eldest daughter, had been away in Bangkok for 18 months, training as a government midwife. Her return was an event of special joy and pride for Pâ-noi, and the daughter goes to work at the local government health centre. As for the mother, a change was in train. She is invited to join a training course for village midwives. The main idea is to interest them in telling village women about the family planning services that are available.

This training course for 136 moh-tamyae, or village midwives, was the start of a project carried out in 1973-74 by staff of Mahidol University's Faculty of Public Health under Dr Srisomang Keovichit and with an IDRC contribution of \$39,700. It was an attempt to gauge the feasibility of integrating Thailand's 13,000 moh-tamyae into the national program of family planning, and enlisting their help as motivators who can talk to mothers soon after childbirth about the importance of spacing their children.

Dr Srisomang's final report to the Ministry of Public Health contained many useful recommendations about linking the work of government midwives and moh-tamyae. It also contained the caution that, if the government wanted moh-tamyae to act as motivators, it had better intervene to see that younger women take on this role: most of the older women, according to this sample, were reluctant to do this extra work (they were tired at the end of a long day, and so on) while the younger and more literate women were quite keen.

As part of the project, Dr Srisomang produced a 16-mm color film called "The Smile of Pâ-noi" that told of this work through a family story of Pâ-noi and her daughters. The film was made by Sarach Singhasene; and the camera work by Apron Chamchoy, giving the flavor of everyday life among the canals and villages of Nakorn Nayok province, was exquisite.

By agreement with Dr Srisomang the film was re-edited in IDRC by Neill McKee, partly because the original was over-long for a general audience and partly to add more information about the population situation in Thailand for audiences outside the country. Clyde Sanger wrote the new script, which was narrated by Nitiya Métivier. It now runs

Film shows the role o



The real Pâ-noi talks with Dr Srisomang and assistant about her experiences.



Village midwives learn new techniques on a training course.



They also learn about family planning services so they can tell the women.

for 15 minutes and is entitled "Pâ-noi the Village Midwife".

As well as glimpses of colorful Thai celebrations, such as the Festival of Song Kran, the film covers the way the 4-day course had an effect on the work of a midwife and it ends with a dramatic sequence of her attending a childbirth. Pâ Sumpao, who in real life has been a village midwife for some 30 years, proved an accomplished actor in the main role.

The film is available on a month's free loan from the Audio-Visual Section, IDRC Publications Division, P.O. Box 8500, Ottawa. Six copies of the film are being held in Ottawa, and four others were sent to the Asia Regional Office, Tanglin P.O. Box 101, Singapore 10. Inquiries about borrowing copies from the Singapore office of IDRC should be made to Dr John Friesen.

hailand's traditional midwives



'The smile of Pâ-noi' — her real name is Pâ Sumpao, but she too is a traditional midwife, for her this is real life, not play acting.



The young women are keen to take on the role of motivators as well as midwives.

Dr Srisomang talks with Pâ Sumpao during filming.



The village midwife is first and foremost a farmer.



BRIEFS

Agricultural needs studied

Having recently completed a study of the research needs in the health sector for the region, the Latin American Regional Office, through its program support unit, has now begun studies of the agricultural sector in Ecuador and Panama.

The guidelines used in these unique studies are based on a methodological model of data collection and analysis designed by the Program Support Unit using the experience gained in the first experimental study of this type carried out in Colombia's health sector in 1974.

In both Ecuador and Panama the agricultural sector is especially important. Ecuador, although it is now an oil-producing country, is still basically dependent on its agriculture. The knowledge gained of research needs here will be important for the Regional Office, since so far the Centre has not sponsored national projects in

Ecuador.

Panamanian agriculture, on the other hand, is considerably less developed, as the country's economy depends largely on its geographic location as a commercial transit zone. It is of considerable importance, however, since this dependence has resulted in a great imbalance between urban and rural areas and presents acute social problems.

The model has thus been designed to allow necessary modifications according to the specific conditions and demands of a country or sector. The health study already completed in Panama provided valuable experience in this respect, and the work carried out so far in the agricultural sector here shows the need for further modifications, emphasizing the value of a flexible model for such studies.

Ricardo Daza, analyst with the Program Support Unit

Low-cost transport in Asia

Among the ills that afflict large contemporary Asian cities is the increasing deterioration of traffic circulation threatening the strangulation of economic life itself. The persistence of a wide variety of transport modes coupled with an explosive growth of automobile ownership, has aggravated urban transport problems.

A small number of Asian cities such as Tokyo, Osaka, Hong Kong, and Singapore have developed to a stage where they have adopted or are ready to employ expensive mass rapid transit solutions like the subway to move urban populations. In most other cities, however, the transport system is in a period of transition and flux. The phasing out or prohibition of traditional modes on the one hand, and draconian measures to curb the rapid increase of automobiles, on the other, are some of the policy options being considered.

The role of low-cost transport modes, both as a source of employment and as a means for moving goods and people of the low-income population sectors, is poorly understood. Whether the decision was to limit sam-lors (three-wheeled vehicles) from operation in Bangkok or to ban be-caks (muscle-powered tricycles) from certain areas in Jakarta and Bandung, it was based on scanty information about the drivers and their clientele. As a consequence, the policy decisions were not entirely efficacious.

An improved understanding of the various low-cost transport



modes in Asian cities with the likely feedback for more informed policy-making constitutes one of the main objectives of a recently approved Centre-supported project. It will involve a systematic survey and analysis of the human energy and motorized low-cost transport modes in Manila, Chiang Mai, Bandung, Jogjakarta, and Istanbul. The researchers met in Manila in January 1975 to develop a common research methodology.

From 6 to 9 January 1976, the group met again in Jogjakarta to discuss the details of sampling designs, questionnaires, and other aspects of the project. Apart from the four country studies, a coordinator has been contracted to undertake the comparative analysis. Field work for every country team is soon to be launched and the group has agreed to meet later this year to review and exchange preliminary study results and experience.

*Yue-man Yeung,
Senior program officer,
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Preparing for UNCTAD

In preparation for the fourth United Nations Conference on Trade and Development to be held in Nairobi in May 1976, UNCTAD launched a program of national and regional seminars designed to involve as large a public body as possible in discussing the issues that are relevant to the New International Economic Order and would figure in the Agenda for UNCTAD 4. The program was designed to bring together intellectuals, academic groups and development research institutes in the expectation that they would make a substantial contribution to the deliberations, and has involved research institutions from developing countries, developed market economy countries, and the socialist countries of Eastern Europe. By the time the program is completed nearly 40 national seminars will have been held, and regional seminars in Asia, Africa and Latin America.

In Asia, national seminars were organised in Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka and Thailand. The Asia Regional Seminar was held in Singapore from 8-11 December 1975 at IDRC's Regional Office, and was attended by representatives from Korea, UNCTAD and IDRC in addition to those countries.

The regional seminar concentrated on three main issues: commodities, industrialisation and the transfer of technology, economic cooperation among Asian countries and access for them to markets in developed countries. The most extensive discussion was on commodity problems — a reflection of the interest evoked by UNCTAD's integrated program for commodities that is currently under discussion and is likely to be the main item on which agreement could possibly be reached at the Nairobi conference.

Among the participants at the Asia Regional Seminar were four government administrators, three central bankers, five university teachers and eight research workers, so the majority of those who participated were from groups whose participation was sought at the time the seminar program was launched by UNCTAD. The seminar was held under the auspices of the Economic Research Centre, University of Singapore and the Association of Development Research and Training Institutes in Asia and the Pacific (ADIPA) of which the Economic Research Centre is a member.

*Nihal M Kappagoda, Director,
Asia Regional Office, Singapore.*

The role of the mass media

Seventy editors and writers in 16 Asian countries now receive Science Reference File, SCIREF, the fortnightly science and technology information service set up by the Press Foundation of Asia (PFA) with support from the IDRC's Publications Division.

This is a small beginning in what Asian writers hope will be a major attempt at strengthening the role of mass media as agents of scientific literacy. The need for writers who can interpret scientific and technological developments is considered vital at a time when correct public attitudes need to be created for the application of science in the day-to-day lives of the people.

It was in response to this need that seminars for Asian science writers — and would-be science writers — were held in Angono, the Philippines and Lucknow, India — with the co-sponsorship of PFA and the IDRC. Great interest in science and technology writing was shown at both seminars in which media representatives and scientists took part. There was general agreement that Asian writers would benefit from increased exposure to models of good science writing. Hence, PFA sought and received IDRC support to inaugurate a science and technology information service.

An introductory letter accompanying the first issue of SCIREF says: "Shortage of skilled science writers and background material are the two major hurdles in widening science news coverage in Asia's mass media. To improve information resources on Asia's fast developing scientific activities and technological undertakings, the PFA is launching with this issue an important reference tool... The service offers desk writers a cumulative file of selected clippings including think-pieces... The service has a dual objective: to help improve your science writing and editing, as well as to enhance your library strength on science reference material."

SCIREF is put together by a staff of 10, who monitor 450 science news sources, both specialized and general. Each package contains an average of 80 items, which will eventually rise to 100. SCIREF recipients will receive four quarterly indexes every year. "Initial response has been positive", says SCIREF's director, M. P. Gopalan. "This is Asia's age of science, and Asian mass media must be helped to play their part in the great changes that lie ahead".

*Ernest Corea, Associate Director,
Publications Division*

REGIONAL NEWS

Singapore

The expansion of small-scale industries in developing countries is essential to their economic development — if only the problems inherent in it can be effectively surmounted. "International co-operation" is perhaps the only effective and lasting way, and this is synonymous with TECHNONET. The principal difficulties lie in bringing together for collaboration a variety of people, most of whom have diverging interests, vastly different resources, languages, cultural backgrounds and levels of industrial development. In spite of these difficulties, the TECHNONET Asia Project has built up momentum, the effects of which may prove to be very telling in its next stage.

To strengthen the links essential to TECHNONET's activities, two conferences were held in Manila mid-November 1975. These were the second TECHNONET Council meeting and, overlapping with it, the first Asian Industrial Extension Officers' Conference. The Council is composed of the heads of TECHNONET's 11 "participating organizations" — all directly concerned with small-industry development — in nine Asian countries, while the conference brought together some 28 of their young extension workers for the first such meeting ever held.

The main theme of the council meeting concerned the council's intent to develop a self-supporting network of TECHNONET participating organizations. In keeping with this, it was agreed that each participating organization will draw up its own "forward program" in industrial information and extension, expressing sectoral priorities and indicating where IDRC support is desired. These will be used to develop TECHNONET's collective forward program.

Each participating organization will, with TECHNONET Centre's assistance, conduct an "information needs survey" including the need and feasibility of applying an information indexing, storage and retrieval system which could also greatly facilitate 'direct networking' (or 'transfer linkages') between them. Meanwhile TECHNONET Centre, operating out of the Asia Regional Office in Singapore, will continue as a

referral point for information within TECHNONET and further develop information sources outside the network.

A more dynamic system of self-appraisal was also adopted, whereby each participating organization will periodically report on progress against its own forward programme, and this will serve as a basis for the council's assessment of the development towards self-reliance of each organization and of TECHNONET as a whole.

Another significant area of council discussion concerned the training of industrial extension officers based upon the recommendations of the TECHNONET Training Committee formed by the council during its first session. The desirable features of training courses for industrial extension officers were carefully re-examined with the conclusion that courses should be designed to develop an appropriate attitude for effectively communicating with small-scale industries and to enhance the trainee's diagnostic abilities rather than to impart expertise in any specific field of technology. Tentative plans were also made to develop suitable local training programmes at certain participating organizations to match the variety of needs, conditions and limitation of resources.

Council members were also able to observe the final session of the extension officers' conference and note the recommendations made. Most of these recommendations were in keeping with the aims of the council and were subsequently approved for consideration in TECHNONET's Forward Program.

It should be particularly noted that out of the extension officers' conference was born an association, tentatively to be named "Asian Industrial Extension Officers' Forum", which will operate under the umbrella of TECHNONET Asia. It will serve as a medium for the exchange of ideas and experiences to strengthen the industrial extension officers' professional effectiveness and capabilities, and to promote 'direct networking' between Participating Organization personnel.

Santi Grachangnetara

TECHNONET Engineer

Bogota

In spite of its importance for development Latin American research on social communication is not only scarce but dispersed. Information about the results of such research is not widely circulated, with the result that a great deal of time is wasted in unnecessary duplication of effort.

For this reason, and before the volume of this research (which at present includes over 1000 titles) becomes any thicker, thus making the task more difficult, it is necessary to collect, process and disseminate it in a systematic way.

Latin America has more than enough "clients" for the results of such a task — given the existence of some 120 schools of journalism and communications, institutes of education, political science, sociology and the like, in addition to numerous development agencies with research units, not to mention individual scholars — all of whom are in need of access to the existing documents on communication.

It was in response to this need that the International Centre for Latin American Higher Education in Communications

(CIESPAL) in Quito, Ecuador, and the University of Wisconsin in the USA, began work in this area a little over a year ago with the support of the IDRC. As one of six UNESCO regional centres for communications research and documentation, CIESPAL forms part of a worldwide network, and is the only Latin American agency specialized in the field. The University of Wisconsin has the oldest program of Ibero-American studies in the USA, and is one of the principal promoters of communications research in Latin America.

The aim is to acquire and classify all relevant scientific studies produced in Latin America since 1960. Those in English are processed in Wisconsin, while those in Spanish and Portuguese are handled at CIESPAL. Already over 1000 documents have been processed, and the resulting abstracts will form part of a preliminary bibliography, to be distributed throughout the region.

Susana Amaya

Cropping Systems for Small Farms

It is rice harvesting time in Indramayu District on the north coast of West Java. Handlebars and fenders laden with sheafs of the gold-brown harvest, bicycles wobble their way from the fields to the villages. In front of houses and along the roadside sheets of unhusked rice — the area's main crop — are spread out to dry.

Indramayu is one site of a cropping systems project being carried out by the Central Research Institute for Agriculture (CRIA), a unit of the Ministry of Agriculture, based in Bogor, Indonesia.

A part of the collaborative cropping systems program developed in conjunction with IRRI, the International Rice Research Institute, with IDRC support, this is one of two experimental sites in Indonesia, both of which are representative of major soil and climatic conditions in Southeast Asia.

The level alluvial clay soils of Indramayu are fertile and the introduction of the direct seeding — *gogo rancah* — method of rice production in the late 1960s has permitted double cropping on land that would normally grow only one

crop. Irrigation, available in parts of the district, has also contributed to an increase in rice production. Most of the crops are however rainfed and the water supply is inadequate for further cropping intensification using traditional methods. And so, explains Mr A. Sjarifuddin, the project leader, pointing to fields where farmers are beginning the back-breaking task of land preparation, the land lies fallow during the dry season when one or two potential crops could be grown.

The growth of secondary — *palawija* — crops during these seasons would

Packaging dried unhulled rice at Indramayu, Indonesia.



prepared for the sowing of rice and a much needed food or cash crop would be produced.

Experience has shown that it is possible to produce these crops in the area, but, says Dr Jerry McIntosh, IRRI agronomist at CRIA and co-leader of the project, agronomic practices have been developed for the more sophisticated level of management practiced by the agricultural experiment stations rather than for the farmer. By testing various rice-based cropping systems in the farmer's fields, with farmer participation, the project aims at developing cropping systems tailored to the needs of the small landholder.

The second test site, Lampung province in South Sumatra, has been a transmigration site for close to 50 years. The agriculture practiced here is mainly upland — cassava, legumes and some upland rice. Irrigation and infrastructure are lacking. Compared to Java, the red-yellow podzolic soils are poor and the low organic level decomposes rapidly. After three to five years of cultivation the soil fertility is depleted and crop production drastically reduced.

Traditionally the farmers of the area practiced a shifting cultivation not possible for the transmigrant families restricted to the two hectares of land provided by the government. Practicing the labour-intensive cropping methods they used in Java where land is limited, a farmer and his family can cultivate only one hectare. The fallow land is quickly reclaimed by *alang-alang* grass, the ever-present weed.

CRIA pilot-projects at both these sites have shown considerable potential for increasing crop intensity and production. In Lampung a 20-year-old tannsmigration site was planted with early-maturing corn and rice. Cassava was planted between corn rows. The corn, then the rice, were harvested and replaced by peanuts between cassava, followed by rice bean, then drought-resistant cow peas during the dry season. With the use of fertilizers, in amounts equal to those used in Java, yields equaled those produced on the best land in Java where the soils are famed for their fertility, Dr McIntosh says proudly.

The two-year project now underway will considerably expand these fledgling cropping programs. In Indramayu, the research team — an agronomist, an economist, a multiple cropping extension specialist and four "spot" workers, graduates from a high school level agricultural college — have, with the help of the kabupaten agricultural officer, selected 27 farmers who each set aside 1,000 square meters of land for the project. In these fields they are experimenting with different crop mixes and varieties, varying fertilizer, weed and insect management and land preparation levels. Up to 24 different crops including sorghum, sweet potatoes, mung beans,

Dr Jerry McIntosh and team leader Acep Syaifuddin examine sorghum.



soy beans, egg plant and chillies are being tested in various combinations.

Divided into three groups the farmers will practice differing cropping systems: some will implement new systems developed at CRIA; others will superimpose new crops and varieties onto their existing systems; the last will carry on as before. All seeds, fertilizers and other inputs required for the experiments are being provided by the project.

The same field studies are being carried out by a similar research team and groups of farmers in Lampung.

Economic and agronomic data based on the farmers' daily records will be collected by the research team at each site and analyzed at CRIA in Bogor for use in planning the second year's experiments involving 100 farmers in both areas.

Training is an essential component of the project. Four provincial agricultural scientists will annually participate in IRRI's cropping systems training program. During the second year, 18 extension workers from surrounding kabupatens will undergo on-the-job training at the original project sites.

The problems of marketing the *palawija* crops and access to fertilizers and other inputs will need to be solved if multiple cropping systems are to be successfully adopted. Difficult though they may be, neither Dr McIntosh nor Mr Sjarifuddin sees these problems as insurmountable. "With the anticipated results from the project and the data gathered, we may be able to convince the government of the profitability of the systems" says Dr McIntosh. "Hopefully" he adds, "the government will take the lead and implement a package assistance program similar to the BIMAS and INMAS production programs which now apply only to rice cultivation". The increased volume of production should also facilitate the development of local and export markets.

The interest manifested by the Indonesian Directorate of Techniques and the Directorate of Extension as well as by the local agricultural offices augurs well for the programs' implementation. Certainly, if enthusiasm is a measure of future success, improvements in cropping practices and in the welfare of Indonesian farmers will not be long in coming.



Village youths are also interested in the experimental sorghum crop.

Photos: Michelle Hibler

Grain preservation

Bob Stanley

Harvest time in Senegal. A dozen or more men are at work in the field, cutting the millet stalks with metal blades bound to their hands, bundling the stalks and stacking the bundles ready for threshing. It is a familiar sight in much of rural West Africa, where millet is one of the staple grains that make up the basis of most meals.

It is backbreaking work beneath the hot sun, but if it has been a good year, if the rains have come, if the millet fingers are fat, the stacks grow quickly and the men sing as they work. A good harvest means full granaries and the assurance of food for all throughout the long dry-season that lies ahead. Or that is what it should mean.

But here is another all-too-familiar sight — long before the first stack is completed, the first of the ants appear. Dozens, then hundreds, then thousands of black soldier ants. Industrious they attack the bundles of millet and carry it away grain by grain, in apparently never-ending columns. The ants too have granaries to fill.

For the farmers and their families it is a heartbreaking sight. And ants are but one predator against whom they must defend their crop. The birds too must be kept away, and other insects, until the grain is dry and ready to be safely stored in the grain bins. Safely? Safe from the birds, perhaps, but all too often the bins provide little protection from the further ravages of insects and rodents. Sometimes more than half the crop is lost one way or another.

Prevention of this kind of food loss is the aim of a grain preservation project now under way at the national agronomic research centre (CNRA) at Bambe, Senegal, with the support of the IDRC. Here, in a corner of the centre's grounds, are rows of traditional grain storage bins of different types — a collection not just from Senegal but from several West African countries. The purpose of bringing them all together here is to try them under identical conditions and find out which of the traditional storage methods is the most effective.

In charge of the research is Dr Gordon Yaciuk, an agricultural engineer whose home is on the Canadian prairies. He explains the storage trials that are being carried out. In one bin is a mixture of sorghum and millet. The smaller millet grains mix with the sorghum and allow less space for insects to get in and move around. The two grains can easily be separated when they are needed by sieving.



Ants attacking bundles of freshly harvested millet at Bambe.

Another bin contains a grain and sand mixture. Sand is plentiful and cheap here, and when mixed with the grain it not only restricts the movement of insects, but is sufficiently abrasive that it could kill them. The main problem with this technique is that of removing **all** the sand from the grain later.

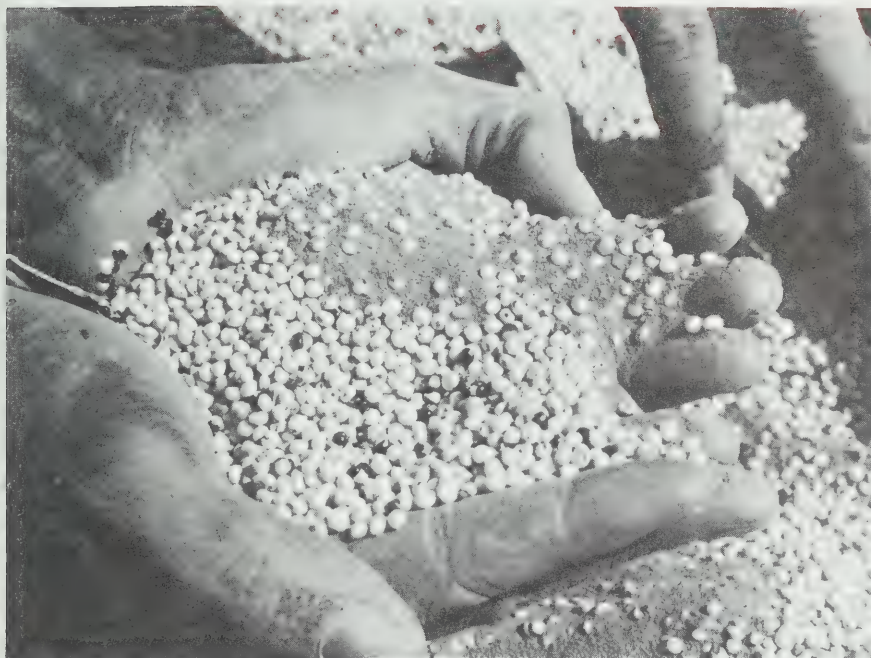
There are modern bins at the centre too. "Primarily we are looking at alter-

natives", says Dr Yaciuk. "Most six-ton bins are too large for the average farmer, so we have designed a four-ton bin with four compartments, which enables the farmer to store four different kinds of grain, and this is working well. We have looked at a three-ton concrete bin which is technically good, but it is too expensive. The cost is a major factor with all concrete bins."

Grain storage bins at the research centre in Bambe — trying to find out which of the traditional methods is the most effective.



utting the food losses



Sand and sorghum mixture to keep out the insects.

He recalls a recent visit to the centre by a group of farmers from a neighbouring village. "We simply let them look at everything and decide for themselves what was best", he says. "Once they saw the results we were getting with the traditional bins they weren't even interested in the concrete bins."

Another storage method is to put the grain in sacks and stack them in sheds.

The sheer bulk of the stack helps to protect the grain, keeping out insects and maintaining a fairly steady temperature, says Dr Yaciuk. In one series of trials, even after 18 months, the grain in the centre of the bags was found to be in good condition, only the outside of the bags having been damaged. Grain has also been stored successfully in the bins at the centre for over a year.

Doda Ngom and Ibrahamba Faye, two of the local workers at the centre who helped construct the traditional grain storage bins.



Photos: Neill McKee

Dr Yaciuk is confident that great improvements in grain storage, and an accompanying reduction in losses, can be achieved without necessarily resorting to expensive imported concrete and steel bins. The locally made bins, he points out, although they are built on apparently flimsy bamboo frames, are surprisingly strong, and in many cases could be made much more efficient with only a few minor modifications.

Improved storage, however, is only half the battle. An equally important aspect of the project is concerned with drying and threshing the grain. If it is not properly dried it may develop mould, and there will be even greater losses. If it is not threshed it occupies vastly more space and is much more liable to attack by insects.

At the centre long narrow racks have been built, of simple construction and using locally available materials. Because they are oriented to take best advantage of both sun and wind, these racks allow the millet bundles to dry far more quickly than the traditional cube-shaped stacks that the local farmers build on the ground. Speeding up the harvesting process is an essential element in the grain preservation project.

Hand-threshing millet is a slow laborious process too — a woman may, with practice, be able to thresh two or three kilos an hour. Two small experimental decorticators — threshing machines — have been developed at the centre. If they are successful and can be put into general use they could free the women from hours of work each day, time that could be more productively spent. Dr Yaciuk envisages village vegetable gardens, even a chicken industry — with the chickens fed, of course, on waste grain.

In the long run the researchers hope to be able to introduce a total postharvest system. Most of the trials conducted at the centre are duplicated under field conditions in the villages. And it is here that such a system will have to be developed. Dr Yaciuk feels that the women — who do the threshing, pounding and cooking of the grain — are the key to acceptance of a total system.

As a first step a survey has been started, involving some 800 families in the villages of the surrounding countryside, to identify the needs of the people for a postharvest technology system. The results of the survey will help to determine the direction of future research.

Universities collaborate on new project

John K. Friesen

Research today is generally a group effort. When research is organized to involve a network of institutions, the cooperative findings can be all the more rewarding. In recent years, growing concern over the world's burgeoning population has stimulated research in human reproduction.

As medical research calls for substantial resources, the more ambitious programs are found in research centres of developed countries. An exception is India which, at its All Indian Institute of Medical Sciences, is doing remarkable studies in reproductive biology and contraceptive technology.

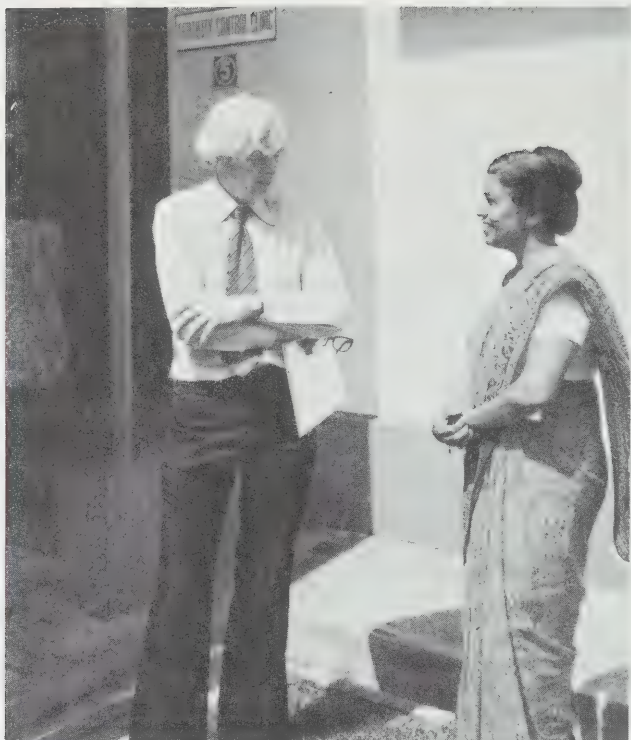
In 1975, three Southeast Asian university Departments of Obstetrics and Gynaecology chose to pool their resources for collaborative research in fertility. The three medical faculties involved are those at the University of Malaya in Kuala Lumpur (Professor T. A. Sinnathuray), Universitas Sumatera Utara in Medan (Dr M. J. Hanafiah), and the University of Singapore (Professor S. S. Ratnam).

In their initial discussions, the Directors of the three cooperating university departments agreed on the following project objectives:

- to undertake research in areas of common interest in the general field of human reproduction;
- to train personnel in project related areas;
- to coordinate activities through a Joint Committee to meet in rotation at each of the three centres;
- to establish a central Secretariat to collect and collate data and administer the research network.

A glance at the five fields of collaborative research indicates the ambitious program on which the three universities have embarked. The first area is the use of prostaglandins in relation to the induction of labour, menstrual regulation and determination of pregnancy. In this field, the program is fortunate in having the counsel of an international authority, Dr Sultan Karim.

The second activity is a comparative evaluation of intra-uterine devices, including the promising copper-coated IUDs. A study of metabolic changes in women taking oral contraceptive pills is another activity of significant interest to policy makers for family planning in multi-cultural societies. A fourth comparative activity will study two injectable contraceptives, Norigest and Depo provera. Finally, two ap-



Dr John Gill, Acting Director of IDRC's Population and Health Sciences Division, with Miss Vera Verghese, the project administrator.

Photo: John Friesen

proaches to female sterilization will be studied — laparoscopic and culdoscopic sterilization.

In order to assure efficient coordination and administration of their regional project, the three Chief Investigators decided to set up a central office for this purpose, conveniently located at the University of Singapore. Miss Vera Verghese, an experienced administrator, was selected to head the Secretariat.

A major function of this central office is to assist in processing and distributing the various research protocols and later to collect and collate data for comparative use. Data processing will be done by computer and will facilitate tabulation of substantial samples in each research area; e.g. in menstrual regulation the sample is 1,500 patients; in the IUD comparative evaluation the sample is somewhat larger.

A rewarding aspect of the project is the training component. This is particularly the case for say an institution than has had less experience than others in doing research or that has only recently appointed staff for this purpose. Participants, including both physicians and paramedical staff, may receive training at one or several centres.

It is the contribution made by the three universities to the project that reflects the priority they are setting for investigations in human reproduction. Each university is investing staff time, equipment and other facilities — contributions that mean much to institutions in developing countries. A three-year grant by IDRC, totalling \$263,600 enables the university departments and their central administrative office to carry out their extensive research program.

The collaborative project, launched in mid-1975, is away to a good start. Its progress will be watched by other Asian countries as they too seek to broaden the base of the world's limited knowledge in the important field of human reproduction. Today there is a growing awareness among scientists, planners and policy makers that research results applicable in one region do not necessarily apply to another. Cultures are much too diverse to accept such an attitude. It is for these reasons that the three universities in Malaysia, Indonesia and Singapore have undertaken this timely three-year project in methods of fertility regulation.

Dr Friesen is senior program officer for Population and Health Sciences with IDRC's regional office in Singapore.

REMOVING CONSTRAINTS TO SMALL FARM PRODUCTION: THE CAQUEZA PROJECT, by H. G. Zandstra, K. G. Swanberg and C. A. Zulberti. Published March 1976, 32 pages, IDRC-058e.

The Caqueza Project, begun in 1971 by the Colombian Agricultural Institute in cooperation with the IDRC, is an integrated rural development program that today encompasses a total of 22 individual projects. This report by the IDRC team describes some of the progress made during the program's first four years and gives the results of a series of studies that have been carried out over the same period. Illustrated. Microfiche edition available.

CASSAVA — The Development of an International Network, by Barry Nestel and James Cock. Published March 1976, 70 pages, IDRC-059e.

During the past four years Canada utilized or committed over \$7 million for research on cassava. This publication explains how and why this large program was developed, what it has achieved to date and where it may lead in the future. This is the ninth publication dealing with cassava with which the IDRC has been associated. Includes statistical tables and charts. Illustrated. Microfiche edition available.

RICE POSTHARVEST TECHNOLOGY, edited by E. V. Araullo, D. B. de Padua and Michael Graham. Published March 1976, 394 pages, IDRC-053e.

This is a comprehensive training manual, the first of its kind, based on material originally prepared for a regional training course at the University of the Philippines. It provides a wealth of useful information and advice for all who are directly concerned with rice production, protection, processing, marketing, distribution and use, and is specifically designed to serve as both a teaching aid for future training sessions and as a convenient reference work. The manual is illustrated with black-and-white photographs, charts and diagrams.

HIDDEN HARVEST — A systems approach to postharvest technology, by David Spurgeon. Published February 1976, 36 pages, IDRC-062e.

Without one ounce more fertilizer, one more new seed variety, one extra acre of farmland, it is possible to increase the world's annual food output by tens of millions of tons, says IDRC Publications Division Director David Spurgeon. Billions of dollars worth of vital food is lost between the field and the kitchen —

New publications

waste that could be prevented by adopting a totally integrated system for harvesting, processing, storage, transportation and marketing. Illustrated with photographs and diagrams. Microfiche edition available.

COWPEAS — Home preparation and use in West Africa, by Florence E. Dovlo, Caroline E. Williams and Laraba Zoaka. Published January 1976, 96 pages, IDRC-055e.

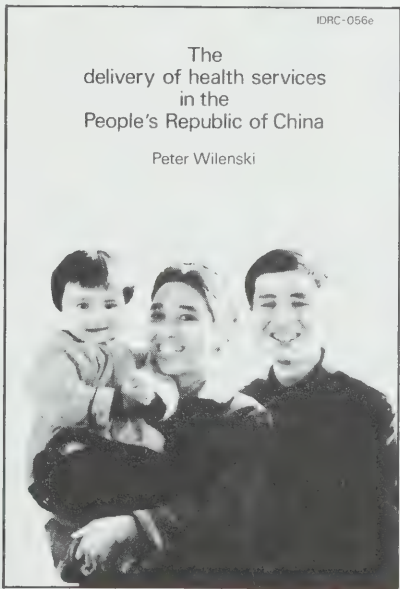
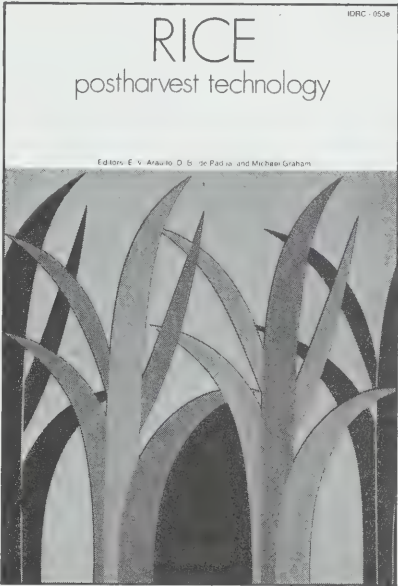
In the words of the authors, all West African home economists: "The art of African cookery has been an oral tradition for generations. This publication draws upon these traditions and skills of cooking and processing cowpeas in West Africa." Although it contains 55 recipes — from cowpea crepes to cowpea flour soup — this is much more than a cookbook. Cowpeas are a universal staple in West Africa, important because they are highly nutritious and are grown primarily for local consumption. The publication is part of a program to further develop the potential of cowpeas, and is aimed primarily at teachers and extension workers. It also contains information on comparative nutritional values, purchasing, processing and storage of cowpeas. Illustrated with colour and black-and-white photographs and drawings. Microfiche edition available.

THE DELIVERY OF HEALTH SERVICES IN THE PEOPLE'S REPUBLIC OF CHINA, by Peter Wilenski. Published February 1976, 59 pages, IDRC-056e.

In recent years there has been an increasing number of reports on the health system of the People's Republic of China, many of them describing in detail various features of China's health policies and programs. This monograph, which was written with the assistance of an IDRC grant, draws on these reports and other documents including original Chinese publications to provide an overview of China's health system. Generously illustrated, also includes almost 200 references. Microfiche edition available.

HIDDEN WATERS IN ARID LANDS, L.A. Heindl, editor. Published December 1975, 18 pages, IDRC-057e.

This is a report on a workshop on groundwater research needs in arid and semi-arid zones, jointly sponsored by the IDRC and the Association of Geoscientists for International Development. Includes conclusions and recommendations for research needed to accelerate and guide groundwater use and development. Microfiche edition available.

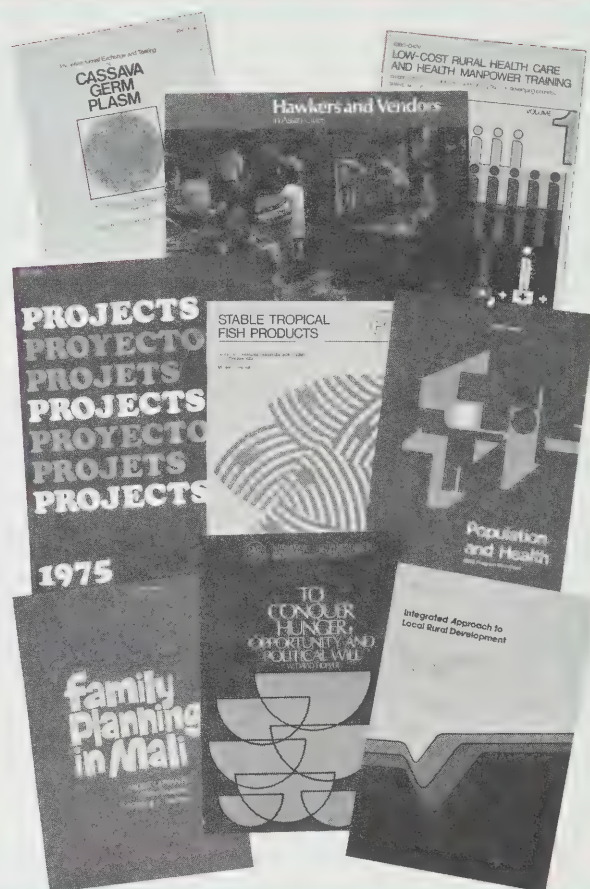




INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population and health, information sciences, and social science and human resources. A list of past and current publications is available on request.

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Reports

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Intensifying small
farm production





CONTENTS

Catastrophe or New Society?

Latin America's response to Limits to Growth, reviewed by Clyde Sanger . . 3

People power

What lessons can be learned from the Chinese experience?
Article by Bob Stanley 6

Village volunteers boost Thai family planning

John Friesen reports on a new project in rural Thailand 7

Briefs

People, projects, events 8

'We know a better way...'

Photo feature 10

Earthquake

Reports from Guatemala, in the aftermath of disaster, and Ethiopia,
where scientists are working to minimize the effects of future quakes 12

Making the most of Asia's small farms

Ed Weber reviews efforts to improve the lot of the small farmer 14

The Captain takes a new tack

Human Resources, by Clyde Sanger 17

'You have found the ideal formula'

Pierre Pradervand reports on a success story in West Africa 18

New publications 19

The IDRC Reports, a magazine about the work of the International Development Research Centre and related activities in the field of international development, is published quarterly at the Centre's head office, and is available on request from the Publications Division.

Established in 1970 by Act of the Canadian Parliament, the Centre is a public corporation supporting research designed to adapt science and technology to the specific needs of developing countries, and concentrating in the following fields: Agriculture, Food and Nutrition Sciences; Population and Health Sciences; Social Sciences and Human Resources; and Information Sciences.

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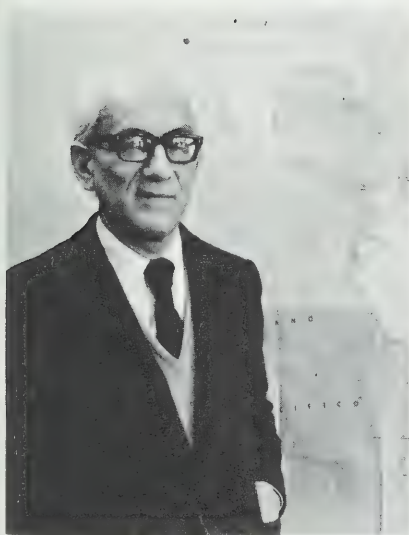
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Cover photo by Neill McKee: Young IIRI researcher gathering data about small farm operations. Article on page 14.

Catastrophe or New Society?



Dr. Amilcar Herrera, project leader: "Up to our necks in realistic solutions."

My father thought he was bringing Salvation to Africa. I do not any longer know what salvation is. I only know that one man cannot find it for another man, and one land cannot bring it to another.

— from *The Tomorrow-Tamer*, by Margaret Laurence.

In 1970 several Latin American scientists were invited to a meeting in Rio de Janeiro, to sit down with members of the Club of Rome and to analyze and discuss the "World Model III", which was soon to be popularised in the book *Limits to Growth*.

It was a lively meeting, and the Latin Americans did not hide their strong feelings from Professor Dennis Meadows and his team from the Massachusetts Institute of Technology. As Amilcar Herrera says these days: "We thought it a very dangerous political document, behind a curtain of apparent objectivity."

They were not content simply to criticize. They decided they would recruit a team of Latin American experts in many different fields — from food production and population to urbanization and housing and pollution — and build their own alternative world model. They would publish its results, which would certainly in turn be a political document, but avowedly so. It would give a Third World viewpoint on the future of humanity, but it clearly would not claim to speak for all the Third World.

A year went by before a five-man consultant committee based at the Bariloche Foundation in Argentina was satisfied with a paper stating the hypotheses and the variables to be used in the model. Then for two years the 20-strong project team was hard at work, supported by an IDRC grant. Dur-

ing last year the text summarising the results obtained from their computer runs was revised, and translated into several languages.

In June a condensed version was published in English by IDRC under the title *Catastrophe or New Society?* (see page 19) and Dr Herrera, as project leader, addressed seminars in Toronto and Ottawa to introduce it to Canadians. Elsewhere it is being translated into Spanish, French, Italian, Portuguese (in Brazil), Japanese and Arabic. A complete English version will be published around the end of the year by a commercial publishing house.

Where do the Bariloche scientists in their work diverge from those who enunciated *Limits to Growth*? In a broad sense, they turn the attitudes that informed the earlier work upside-down.

Meadows was confined inside the lines (of population growth, food production, mineral depletion and so on) that were drawn by projecting forward several decades from present statistics and current trends. The MIT approach, which was rejected at the Rio meeting, was seen as being based on the preaching that the world's main problem was rapid population growth in the Third World, and that this had to be contained if catastrophe was to be avoided.

The Bariloche group took issue with this premise on several grounds. For millions of people, oppressed with hunger and disease, catastrophe is a present condition rather than a future fear. As Herrera put it in a seminar: "We're living in a catastrophe now; it's not a question of waiting 80 years to see one." Then, because the MIT model dealt with statistics in global aggregates, it took no account of the fact that 25 percent of the world's population (the people in the industrialised countries) was using up more than 85 percent of the world's nonrenewable resources. This was a bigger cause for explosions on this globe than population growth.

The group also disagreed with the



The industrialized countries use up more than 85 percent of the world's non-renewable resources — the real cause of the problem?

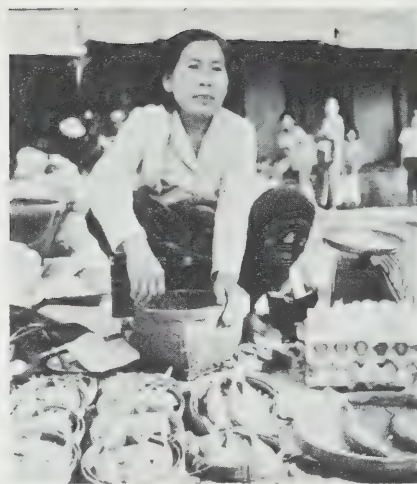


Photo: Roberta Borg

Everyone should have at least 3000 calories of food and 100 grams of protein a day.

view that there was a close correlation between a country's per capita income and its population growth rate. They pointed to Uruguay, whose GNP worked out at only \$600 per capita but whose population was increasing more slowly than that of Western Europe. The likeliest reason for this, they argued, was the high level of social security that had long been available in Uruguay.

Out of this came a basic hypothesis that the Bariloche group set out to test in their study: that the only truly adequate way of controlling population growth is by improving basic living conditions.

So they cut free of the rigidity of projections, which Herrera thinks anyway soon become pretty meaningless, since they tend to assume that socio-political structures endure unaltered, whereas they are in a constant state of change. And they flew off to a normative vantage-point, declaring that every human being, by the simple fact of his or her existence, had an absolute right to the satisfaction of basic needs in housing, health, food and education.

Education was included as a fundamental need, because in the egalitarian society the Latin American team posited there should be full participation by the people in major social decisions. And, for the reason that different peoples will vary in the paths they choose to move from the present unsatisfactory (the word "evil" creeps in occasionally) system of maldistribution of resources to these utopian societies, the Bariloche model does not explore the mechanisms for bridging from the present to this future; rather, it was set up to test whether it is possible to liberate society from underdevelopment, by satisfying these basic human needs for everyone. It is not a political blueprint; in the chapter entitled "The Current World — Misery and Overconsumption", the socialist model is criticized for offering too little participation, while the capitalist model is criticized for creating dependency and inequality. It is more a vision of what is possible.

The rest was the grinding work of putting it all into mathematical terms, building the economic and the demographic sub-models, and then assembling the full model. Hugo Scolnik, Deputy Director of the project was responsible for the mathematical part of the model and took over direction of the project for a time while Dr Herrera was working at Sussex. Then the main part in compiling and editing the findings in book form reverted to Amilcar Herrera.

In putting the basic human needs into quantifiable terms, the team decided that everyone should have 3000 calories of food and 100 grams of protein a day; that the goal for education should be 12 years of schooling, enough to reach "the point of educational autonomy" with the ability to make group as well as individual decisions in society. For housing, an initial minimum standard was set for a family of five in developing countries of 50 square metres of shelter with adequate sanitation, and a higher minimum in developed countries of 70 square metres for an average family of 3.5 people. These three goals were

deliberately set above survival level, because the Bariloche group set its sights on a society where *human* needs would be satisfied.

Unlike the Meadows model, which treated the world as a global aggregate, this model broke the world down into four blocks, and tested in each unit the physical feasibility of reaching the goals of basic human needs. They originally thought of simply dividing the world between the developed and developing parts, but ended by separating the latter three ways: Latin America and the Caribbean, Africa and Asia. They treated the four blocks as independent units (which has led to some criticism that the model gives too little account of inter-block trade). The model in fact stipulates that, while there will be interblock trade, there will be no net transfer of capital.

Stipulating that the four blocks should function separately, that the developed world should (for the purposes of the model) cease to draw its natural resources from the other units makes an ironic reversal of the "lifeboat" theories of Hardin and others: in the egalitarian, non-consumerist world of the Bariloche vision, each of the four blocks would have its own lifeboat, provisioned with its own stores and obliged to look after its own population. As it turns out, the crew in the developed world's lifeboat do not starve, although they pull in their belts.

The chapter on the physical limits to development, in particular the section on mineral reserves, may prompt some skepticism although Dr Herrera, a geologist by training, was not challenged on this score during seminars. In this chapter the team maintains that potential reserves of uranium and thorium are sufficient to satisfy energy requirements for a practically indefinite period, and that the one type of pollution that will not respond to corrective measures is thermal pollution. The effects of this man-made problem, however, are difficult to mea-



Schoolchildren in Guyana: education is a fundamental need.

sure accurately, and so far they have been compensated for by the natural processes of the cooling of the atmosphere.

The population sub-model was an innovation that gave the Bariloche team some headaches. But they were determined to explain demographic evolution as a function of a set of socio-economic variables, rather than simply insert population forecasts as an outside factor. Eventually they built their sub-model in which the main demographic variables — life expectancy at birth, birth-rates and average family size — are expressed as functions of seven socio-economic variables: school enrolment; housing; calories and protein intake; population employed in agriculture, or in secondary industry; and a measure of urbanization. The sub-model assumes that rural populations will gradually be grouped into communities of a size that makes it possible to provide essential services, the process of “villagization” on which Tanzania and other countries are now engaged.

To work the model, the team decided to use as the indicator life expectancy at birth (rather than, say, GNP that is most often used in economic planning). They saw it as the indicator that best reflects general conditions of life regardless of country, and an accurate measure of how well the basic human needs were being satisfied. While Meadows’ controller allocated labor and resources to



Photo: Neill McKee

Housing: minimum standards of shelter with adequate sanitation.

production in order to keep supply and demand in balance, their controller made its year-by-year allocations in order to meet the goals of the basic human needs and to optimize life expectancy at birth.

Their conclusions are cheerful ones. There are no physical barriers in Latin America or Africa that would prevent attainment of these basic needs by the early 1990s and the year 2008 respectively. The more populous Asia presented a problem, not in housing or education, but in food production — if yields were calculated at 4 tons per hectare, but no problem at 6 tons. (If

these figures seem high, the team points out they are only about half those achieved in Japan and elsewhere).

The message behind the book is plain. While there are no physical barriers to the elimination of poverty and underdevelopment, there are severe political and social constraints in present systems. Amílcar Herrera put it clearly in Toronto: “Only with very deep changes in social and political conditions is there any hope.”

The Bariloche model has received some criticism. When it was first presented to a three-day meeting of the International Institute for Applied Systems Analysis at Baden, Austria, in October 1974, the point was made that technological progress should be incorporated as a variable, and this was done during the revision period.

Another criticism widely made has been that the controller optimizes on a year-by-year basis, rather than over the entire time-period (1960 to 2060) of the model. Dr Herrera is sensitive to this point, and has spent time in seminars explaining that they took the “myopic” approach because the computer requirements made the long-term approach impossible. He points out, too, that no economy in the world is planned for 100 years.

Finally, there is the criticism that it is all too Utopian, and “not realistic”. Amílcar Herrera answers this type of criticism head-on. Certainly the model is utopian, he says; but it is not a mere intellectual toy, like some of the earliest utopian writings. He prefers to make comparisons with the 19th century socialists, who he says embodied the aspirations of the great mass of the people. As for not being realistic, he retorts that there are two kinds of “realistic solution”: the one he rejects is “the kind that can be realized without disturbing the present equilibrium. In Latin America we are submerged up to the neck in such realistic solutions”. Since there are no easy solutions to the present world crisis, the realism he and the Bariloche team favor has to match in imaginativeness the size of the problem. Indeed, their book ends with a quotation from John Stuart Mill: “For a great evil, a small remedy does not produce a small result; it simply does not produce any results at all”.

They are not offering any country a packaged Salvation, nor setting themselves up as a “tomorrow-tamer” with all the answers. But they are missionaries enough to want to mobilize public opinion and point in a general direction. With their work being translated into seven languages, they are certain to stir an amount of public discussion; The International Labour Organization is already starting to use the model, and Egypt has already responded by applying parts of the model to its present situation. The Bariloche team seems to have made its mark. □



Photo: Neill McKee

How long will they live? The team chose life expectancy at birth as a basic indicator of the general conditions of life regardless of country.

People power

Bob Stanley



Photo: J. H. Lindsay

Late last year the IDRC sponsored a visit by a multi-national inter-disciplinary group of specialists to the People's Republic of China. Their purpose was to study methods used by the Chinese in the disposal and recycling of human wastes — the use of "night soil" as fertilizer is a centuries-old practice in China, but until recently it had also presented serious health hazards.

The group included two Nigerians, a Tanzanian, a Swede and a Canadian, whose specializations ranged from medicine to civil engineering. They were able to visit a variety of locations, including large and small rural communes, modern workers' housing estates, and major cities such as Peking, Canton and Shanghai. Through an interpreter they talked with city officials, apartment dwellers, barefoot doctors, factory managers and members of workers committees. In the process they were able to learn a good deal not only about waste disposal methods (the Centre is currently supporting a number of projects in this field) but also about the lifestyles and attitudes of people in China today.

In one commune with over 68,000 population, the vice-chairman of the workers' committee proudly reeled off statistics of crop production, irrigation projects, factory output, electrification schemes, schools, hospitals and day-care centres — all of which, he stated, had improved vastly since the revolution. Then he added: "There is still much room for improvement . . . the livelihood of the peasants is not good. The quality of life now is much different from pre-liberation days, but the peasants still feel it is just so-so. We feel we have not done a good job of learning from the leading village in China chosen by Chairman Mao as an example of what can be done — we have a long way to go to match them." The influence of Mao as a binding and motivating force is ever present in these conversations.

In pre-revolutionary China the market in "night soil" was a very lucrative one, controlled by powerful businessman employing gangs of enforcers. Profit, not hygiene, was top of their list of priorities. Today such exploitation is a thing of the past: the collection and distribution of the fertilizer is strictly controlled, and the use of sealed containers and advanced processing methods is eliminating the health hazards.

In Canton a city health official speaks of the Chairman's edict to "Get organized, improve hygiene and sanitation, reduce the incidence of illness and improve the health of the people". This is being done, he says, largely through mass health campaigns involving all the people of the city — one campaign for each season of the year. "As a result of these efforts sanitation in our city has improved year after year. We still have to improve the sewage system in the city, but the most important thing is to activate the people to foster the habit of maintaining their homes in sanitary condition all the time."

In another commune a barefoot doctor speaks of "a people's war against schistosomiasis" resulting from the Chairman's call to wipe out snail fever. "We got the masses

of the commune members mobilized to break the shells of the snails, and in the spring we got them mobilized to get rid of the grass and weeds along the riverside. Of course it takes many hours of work and much manpower, but it is effective, and we feel it is worth it. In this way we have eliminated snail fever."

A commune member quotes Mao on the subject of pigs: "The pig is like a small fertilizer plant — if we have more pigs then we shall have more fertilizer; if we have more fertilizer we shall have better harvests; if we have better harvests we can raise more pigs." The commune, says the man, has increased its porcine population fivefold since 1958 — and has experienced a threefold increase in its rice crop.

Life is different for the workers and their families who live on a modern residential estate outside the old city of Shanghai. The estate is a complete entity, explains an official, with 15 factories and all amenities, from schools and hospitals to department stores and post offices. The 4,000 families here have an estimated 1.5 million yuan (about Cdn. \$750,000) in savings at the National People's Bank.

But still there is the concern with public health, both in the home and in the factory, where worker groups propagandize the importance of sanitation, improvement of the environment and wiping out the breeding grounds of flies and mosquitoes. And nothing is wasted: organic refuse and wastes are collected from strategically placed pick-up points each day and transported to the rural areas for treatment and eventual use as fertilizer.

In the fields another barefoot doctor describes the problems of preventive health work among the peasants. "Getting rid of old conceptions is painstaking work," she says. "We have to convince the villagers that hygiene is good for their health. Specifically we emphasize things like environmental sanitation and the disposal of human wastes." How would she convince people that it is not good to eat raw vegetables that have been fertilized with untreated human wastes? "I would borrow a microscope from the clinic, set it up in the village and let the people see. Then it is very easy to convince people."

How much relevance does the Chinese experience have for other developing countries? The Nigerian members of the group — a doctor and an engineer — point out in their report that not all countries have China's "revolutionary approach to life", and warn against blindly copying the Chinese practices. However, they add: "Other developing countries which depend mainly on agricultural production have got a lot to learn from China."

"Most of these other countries spend huge sums of money to import or produce chemical fertilizers, while they allow human wastes to endanger the health of their people. These countries must investigate different methods of composting human wastes cheaply. But the methods must be devised according to the social, cultural and economic standards of the different peoples concerned." □

Village volunteers boost Thai family planning

John K. Friesen



Village children in Thailand. The project aims to make it easier for the rural people to control the size of their families.

What can be done about family planning in a village having no physician, no resident or itinerant health worker, no place to buy contraceptives? Such villages are numerous in developing countries; in Thailand, for example, only one-in-ten villages is covered by a health worker.

Could one possible answer to the lack of health and family planning services be found in local volunteers cooperating with the government's health staff? An ideal third party on the team might be the villagers themselves.

This was the approach envisaged by Dr. Debhanom Muangman, the dynamic young Dean of the School of Public Health at Mahidol University in Bangkok. Displaying a sensitive awareness of rural community well-being, the University had earlier conducted an action research project which found that selected traditional midwives could be effectively involved in family planning activities. Now Dr. Debhanom focussed on another need, namely, how to make contraceptive supplies readily available to villagers at a minimum cost.

Then too there were other health needs than contraceptive supply if national family planning goals were to be reached. Who was there to discuss with husbands and wives the questions about contraceptive methods now used, or where were the nearest services for sterilization or IUD insertion?

Backed by a representative committee of the University's health and social sciences faculties and the government's family planning authorities, Professor Debhanom got approval to launch his plan for community contraceptive distribution. As the village headmen and local health workers were to play a key role, the project invited and received the endorsement of both the Ministry of Public Health and the key Ministry of the Interior, the ministry responsible for the government structure from the village headmen up.

Meeting Dr. Debhanom is to know a first-class administrator who has his project organized to the last detail — from record forms and budget keeping to field staff training and interview schedules. Of the survey team's experiences, the Director noted in his initial report: "The main obstacles to our work were heavy rainfall, bad roads, and cobras. As the heavy rains had flooded their holes, the snakes came up for air. We killed cobras almost every day."

Some 120 kilometres out of Bangkok in Angthong Province, lies the district of Po-Thong (population 52,000) which was selected as the project site. In order to obtain a pre- and later post-profile of the villagers, the project team conducted a detailed baseline survey in May 1975 of nearly one thousand families. The aim was to obtain data on the characteristics of the families the project hoped to serve, family planning including supply sources, attitudes to proposed village volunteers, local means of travel, frequency of radio listening, etc.

A major task was the selection of village volunteers — one for every village without a health centre. Cooperating in this task last summer were appropriately the local health workers, whose job it would be to supervise the volunteers, and the village headmen. Last December, 28 local health workers and 92 village volunteers (mostly married persons) attended their second training course — together. Half the volunteers are farmers, the others mainly shopkeepers. Few dropouts had occurred since recruitment.

Having already distributed condoms and pills to current acceptors, volunteers were now trained to carry out the much more serious job of prescribing oral contraceptives to new acceptors and to make referrals. This is the first time that the Thai Ministry has issued certificates for this service to non-health workers.

Dr. Friesen, formerly senior program officer for Population and Health Sciences with the IDRC's regional office in Singapore, is now based at the Centre's new regional office for East Africa in Nairobi.



A district health officer checks contraceptive supplies with village storekeeper who acts as a distributor.

How is the scheme financed? It is a three-way shared operation with participation by the Ministry of Health, Mahidol University and the IDRC. Out of the Centre grant, which goes mainly toward research activities and training, the volunteers receive a small incentive over the two-year project. However, their main income, again very modest, is from the sale of oral pills (the worker receives 1 baht, or 5 cents Canadian out of the 5 bahts per pill cycle) and 1 baht of the 6 bahts which is the price of a dozen condoms. Incidentally, the health workers who are employees of the Ministry, are also permitted to sell contraceptive supplies at the health centres.

Dr. Debhanom's reports to date cover the first eight months of the two-year project. Already, some tentative results on activities in Po-Thong district are emerging. Foremost is the initial success of involving the villagers themselves in selecting their volunteer and in the activities of distributing contraceptives. They can say with confidence that the volunteer is "one of us, and his services are next door".

Another result which health administrators will note with interest is the project's low cost per acceptor — Canadian \$1.67 — compared with the current \$8 to \$9 national figure. Thirdly, the rate of acceptance has increased. During the August to December period, the volunteers registered 700 new pill acceptors (out of say a total potential of 6,000 women). Condom sales also rose appreciably. Also, there has been the successful collaborative arrangement between the Ministry of Health and the University, with project supervision by both, as well as the co-opting of the Ministry of the Interior (a departure from usual health services) which has assured strong policy approval for the pilot project.

Two other objectives of the project that will require study in the months ahead are continuation rates for acceptors, and the effectiveness of various types of village volunteers.

Of primary importance is the replicative factor. Will the government be able to afford this pattern of distribution? Can the enthusiasm of villagers be sustained in such a scheme? Can the conscientious direction the project now enjoys be assured for other selected areas in which the Ministry may choose to extend these trials?

In the end, it may come as no surprise that most of these and other questions may be answered in the affirmative. After all, the Po-Thong project demonstrates that it is efficiently providing a social service the villager urgently needs. In deliberately involving one of the villagers as a volunteer, in gaining the support of the headman, and in enjoying the cooperation of the health worker — these are relationships that assure commitment. What approach could be better? □

BRIEFS

More food, better food, lower cost

The food science program in Asia forged ahead with sustained momentum during the first quarter of 1976. The Advisory Group of Asian Food Scientists set itself to organize working groups in the areas of food quality control, fats and oils processing and processing of fruits and vegetables by early 1976 in addition to the already operational working groups on rice postharvest technology, legume processing and fish processing.

Through a series of three workshops held in these areas from February to April in Singapore, Malaysia and Indonesia, a nucleus of scientists who will form the specific working groups has been identified. Research priorities have been mapped out to serve as a general framework in future program development.

In the field of food quality control, the working group will look into improved food handling practices at the hawkers and vendors level and into maximised utilization of the mobile training laboratory donated by the Canada Plus-One Project to provide services to the food processing industry. The working group on fats and oils processing will seek to improve processing technologies on the three most important sources of edible oils in the region namely oil palm, rice bran and coconut.

The recommendations made by the fruits and vegetables working group include detailed studies of the total marketing system taking into consideration the physical, biological and economic factors; development of improved packages with initial reference to the bamboo basket; and training at all levels — practical technology, research and management. There was also mention of the need for basic research on postharvest behaviour of tropical produce and of the possible application of solar dehydration.

The overall objective of these three program areas is to reduce wastage, increase both the quality and the quantity of food available to the consumer at a reasonable cost.

With this momentum food science projects in the region will likely more than double in number before the end of 1976, and the credit goes to none other than the food scientists of the region themselves.

E. V. ARAULLO
Senior Program Officer
Agriculture Food and Nutrition
Sciences

Power? It's a breeze

Much needed training

Representatives from more than 20 scientific and educational institutions in Bolivia, Chile, Colombia, Ecuador, Panama, Peru and Venezuela met in Bogota, Colombia, from 15–26 March to attend the first workshop for scientific editors of the Andean Zone organized by CIMPEC (The Inter-American Centre for the Production of Educational, Scientific and Cultural Material for the Press) and sponsored by the IDRC.

The objective of the seminar was to "provide training in graphic arts and other techniques to those in charge of educational, scientific, cultural and technolog-

ical publications in public and/or private institutions." It was designed to provide much-needed training in a field where there is a considerable shortage of professionally trained personnel.

In addition to the training on graphic arts, there were sessions on Latin American communication problems, editing of scientific and educational publications, cost estimating, technical standards and regional book distribution. Participants also had the opportunity to talk with David Spurgeon, Director of the IDRC's Publications Division, and editor of *Science Forum* magazine.

Wonder water weed?

Man's attempts to conquer space have resulted in some unexpected by-products — from improved weather forecasting to non-stick saucepans — but perhaps none more unlikely than the development by the US National Aeronautics and Space Administration (NASA) of the water hyacinth as an answer to water pollution problems, and as a source of cattle feed supplement, fertilizer and bio-gas fuel.

The discovery of the many possible uses of the water hyacinth (earlier regarded only as a nuisance that clogged waterways) came almost accidentally. Concerned about the possible pollution hazards created by their own National Space Technology Laboratory (NSTL) in Missouri, NASA officials designated a team of environmental scientists, headed by biochemist Bill Wolverton, to devise some means of combatting pollutants, and, if possible, of reversing their effects.

The team began to investigate vascular plants (those equipped with a system of vessels that conveys nourishment from roots through leaves). Laboratory experiments showed that one, the water hyacinth, was able to absorb astonishing quantities of nutrients and pollutants from domestic sewage waste waters. Experiments with a fenced three-acre plot in a lagoon serving a residential area confirmed that the plants thrive on sewage-laden waters, and in doing so purified the water.

Next problem: what to do with the eight-to-sixteen tons of plant growth produced per acre per day? The dried, ground plants

were added to corn silage and fed to cattle at the nearby Mississippi State University agricultural experiment station farm, and at the end of a four-month study showed results comparable with a diet fortified with cotton seed meal and soybean meal.

Plants "fed" on industrial and chemical wastes, however, could obviously not be fed to cattle. But laboratory experiments demonstrated that one pound of plant refuse can produce about five cubic feet of methane gas — or an annual yield of about two million cubic feet of methane gas per acre. In addition, the residue from the gas production process can be used as an efficient fertilizer and soil conditioner. Thus the water hyacinth, instead of being an expensive nuisance, could become a profitable source of both feed, fuel and fertilizer.

With scientific caution Wolverton states in his preliminary report that "an expanded research effort might be the start of a permanent solution to present problems such as natural gas shortages, pollution control and control of excessive plant growth, in addition to producing large quantities of fertilizer from the methane gas production process."

Interest in the project is widespread, both in the US and elsewhere. The Sudanese National Research Council, for example, in cooperation with the US National Academy of Sciences, is currently studying the possibility of utilizing the overgrowth of water hyacinths in the White Nile River as a source of fuel, thus solving two problems simultaneously.

Help may be on the way for farmers and small communities in developing countries in search of a simple and inexpensive means of pumping water to their homes or fields. A wind rotor, developed at the Geophysical Observatory of Haile Selassie I University in Ethiopia, could solve pumping problems without recourse to electricity or fuel-operated motors.

Although by no means the first and only windrotor to be developed and used, this one, designed by Mr. Armando Filippini, a part-time volunteer at the observatory, is very simply built of locally available materials and operates at very low wind speeds. When the tree leaves barely move — in fact, says Dr. Pierre Gouin, Director of the Observatory, even before the anemometers start to turn — the present two-meter high rotor turns smoothly. Installed on a 20 meter deep well, with winds of five to ten miles an hour, it

could easily fill a 200 liter barrel every hour — enough water to supply a village or school. In a country clinic equipped with an emergency operating table lit by car headlights and batteries, the same rotor could maintain the water supply and charge the batteries.

Some problems however remain. Says Dr. Gouin: "To minimize the energy loss in the pump, a rotary pump turning slowly would be needed. Generally such pumps rotate much too quickly, at about 1500 revolutions per minute."

The design and efficiency of different sized models are now being tested at the Brace Institute of McGill University, Montreal, Canada. A patent has also been applied for in Canada. Once the patent is obtained, the Observatory intends to popularize the use of the wind rotor, not only in rural areas of Ethiopia, but also in other developing countries.

Governors visit LARO



Photo: Jaime Rojas

Seven IDRC governors visited the Latin American Regional Office in Bogota prior to the Board of Governors meeting held in Mexico City March 14–15. During their three-day visit governors Roger Blais, Louis Berlinguet, Archie Micay, John Milton Bell, Norman T. Currie, William Winegard and Peter Green were briefed on two innovative Centre-supported projects.

CIMDER — the Rural Development Research Centre in Colombia — has been working since 1972 on an experimental rural health program in an area north of the town of Cauca. Officers of this centre met with the governors to describe the program that aims at providing primary health services to 40,000 people while improving sanitary facilities.

The governors also learnt of

rural development efforts in Colombia from Dr Rafael Mariño, director of the Colombian Agricultural Institute. Since 1971 the Institute has been working with smallholders in one of the country's poorest regions. A field-trip to the Caqueza project site enabled the governors to discuss with the farmers the agricultural and home improvement work being carried out.

A slide-sound presentation prepared by the Publications Program staff of LARO provided the governors with an overview of the region. Discussions with Dr Henrique Tono, Regional Director, and LARO staff of the work of the regional office followed. The governors later met with Colombian government officials during a reception offered by the Canadian ambassador. □

'We know a better way...'

The people, the language and the climate are different, but the problem is essentially the same: how to bring basic health care to people in isolated rural communities that are too small to support a resident doctor — even if one could be persuaded to live there. It is also a problem that points up the dangers of attaching labels like "developed" and "developing" to countries, since the two programs illustrated here are serving rural peoples in Canada and in Iran.

Charles 'Skip' Brooks is the Regional Health Educator for the Province of Saskatchewan in the heart of Canada's prairies. He describes how the Community Health Auxiliary Program came into being in 1964 after a group of Indian leaders met with health officials and told them: "We know a better way to do more than just health care — that is education."

The initiative was welcomed by the health professionals, he says, because for years they had been unable, for cultural and linguistic reasons, to deliver either health education or effective treatment to Canada's native peoples on the reserves.

One of the first community health representatives (CHRs) to be trained under the program was Eugenie Lavallée, a Cree Indian and mother of six living on the Piapôt Indian Reserve north of the provincial capital of Regina. Says Brooks: "Somebody like Eugenie comes along and we teach her what we know about health, but the ingredient she adds is the concern for the people and the ability to move amongst them."

Although Eugenie retired last year from her CHR role, she is still an important community figure, he adds. "The health spectrum is so broad that she got into everything. Politics is very important — she is a councillor now (the first woman to be elected to the council) and she influences the thinking of the people making decisions about development on the reserve."

While the historical and cultural background of Canada's native people may be unique, the CHR program has a broad enough application that it has attracted attention from outside the country, including Iran, where an experimental village health worker (VHW) program was begun three years ago with the support of the IDRC. The program's director, Dr. Houssain Ronaghy, Head of the Department of Community Medicine at Pahlavi University, has had considerable correspondence with Mr. Brooks and his colleagues, and both groups have gained from the resulting exchange of information and ideas.

About two-thirds of Iran's 33 million people live in some 60,000 villages, most of which are far too small to support a resident health professional. Iran has only about 12,000 trained physicians, most of whom practice in the large population centres, but, says Dr. Ronaghy, "Even if we had enough physicians, they would not be suitable for that kind of community, so there would be no choice but to create a kind of manpower socially, economically and mentally suited to village life."

Iran's VHWs receive six months training in both preventive and curative health care, and are then assigned to a village to provide basic health services. Like their counterparts in Canada, they refer the more serious cases to a physician or a middle-level health professional, and they also receive a small salary for their services.

It is too early yet to assess the full impact of the program, the second phase of which is now fully supported by the Iranian government, but Dr. Ronaghy is optimistic. A preliminary survey shows that in the villages with a VHW, infant mortality has been cut by 50 percent compared with the national average for rural areas. And, almost as important says Dr. Ronaghy, the VHWs are "very much accepted" by the villagers themselves.

Or, as Eugenie Lavallée puts it: "Your people come to learn to trust you."

Photos by Neill McKee
Story by Bob Stanley



Eugenie Lavallée — "Before I started training I had to visit every home on the reserve and question people about their health needs. I had lived on this reserve many, many years, and yet until then I did not know half of what was going on. I was too busy raising six children.

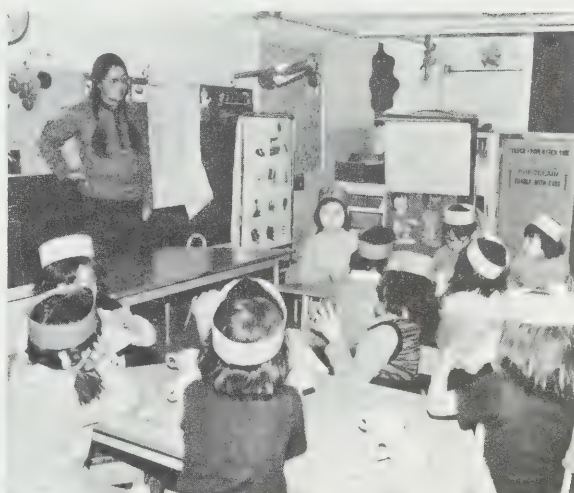
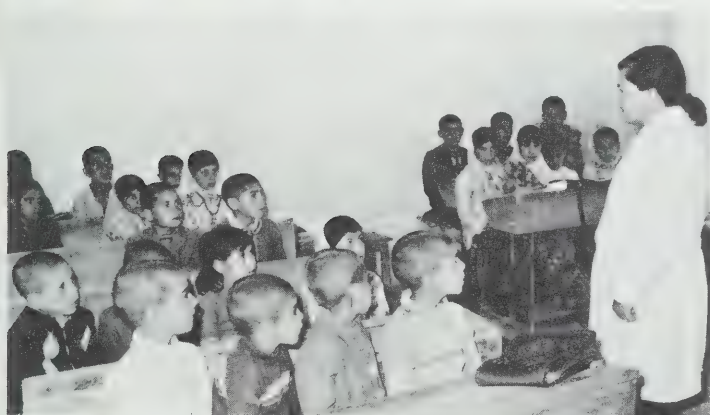
"I was always interested in people, I think that was the main reason I got involved. At first I was afraid of what kind of response I was going to get from the people, but I had a good field nurse, and by the time she left I was even getting gardens going, and had started a women's club. I also had pre-natal classes, immunization and x-ray programs, spring clean-ups, and always home visits.

"Your people come to learn to trust you. Many years ago in Lone Lake, after our first meeting when I told the people in their own language why I was there, one old man said to me: 'You know this is the first time somebody ever comes here that we understand'. They don't usually tell me to my face, but by their actions. And today my people here have respect for me. They still come to me.

"I retired last year at age 65, not rich at all, but with a lot of friends. I always wished I could have been younger when this program came on, because there was a lot of things I felt I hadn't fully accomplished."



Iranian boy and Canadian girl: the health of the children is one of the community health worker's primary concerns.



In school the children learn from the community health worker about basic hygiene and nutrition. Classrooms in Iran (left) and Canada (above right).



Out of school activities are much the same for rural children anywhere. Watering cattle in the Canadian winter (left) and herding sheep in Iran (above).

The following article is based on a paper presented by Hermes Marroquín, the Guatemalan delegate to a meeting of national groups carrying out low-cost housing studies held in Costa Rica last April. The meeting was sponsored by the IDRC and SIAP (the Inter-American Planning Board). The paper, prepared by the Institute for Economic and Social Growth of Central America, is a preliminary report prepared three weeks after the disastrous Guatemalan earthquake. On the opposite page Michelle Hibler reports on preventive measures being taken to prevent similar disaster in Ethiopia.

Guatemala counts the cost

The violent earthquake that shook Guatemala on February 4 of this year affected almost every phase of national life. At first sight, of course, the most shocking fact was the sheer destructive power of the quake, seen in the loss of lives, housing, communications and public services. But there is something equally horrifying — the social aspect of the earthquake's ravages.

The quake, with an intensity of 7.5 on the Richter Scale and a duration of 35 seconds, was caused by a shift of the tectonic layers in contact along the Montagua Fault. Its effects were felt by 57.4 percent of the country's population living in 16 of the 22 provinces. Seven provinces suffered catastrophic ravagement. The total death toll was more than 22,000, with 75,000 injured.

The area has a long history of earthquakes. Testimonies to such movements are found in Mayan texts and in colonial literature. Geomorphically, the earth's faulted structure undergoes permanent tectonic activity. Earthquakes in the area, obviously, are no novelty.

In such a situation experience should have produced preventive measures — including anti-earthquake housing design and construction. But such standards are too costly for the poor people, and as a result the majority of all the low-cost housing in Guatemala was destroyed, while some wealthy residential areas in identical terrain were relatively undamaged. In other words the earthquake did not affect all sectors equally.

Little damage was suffered by large industry, but small and medium sized industries, especially urban and rural handicrafts, suffered greatly, since in these small operations a considerable part of the capital is invested in the building itself. For these small industries, relocation, cultivation of new clientele and the replacement of equipment will be a long and painful job.

Similarly, the large scale agricultural sector was not greatly affected, largely because it was outside the range of the quake. But in the highlands 65,000 small farmers lost their housing, and 11,000 their lives.

In the commercial sector, as in the

other sectors, large installations did not suffer great damage, and were able to absorb what losses they did suffer. But for the small businessman the loss of existing stock is a significant part of his investment. Furthermore, the small businesses were mainly in the hardest hit areas, where the population has had to restrict its consumption, and the influx of external aid in the form of food and goods has reduced consumer demand even more. The traditional small marketplace has completely disappeared, at least for the present.

All the social and economic activities of the country have been affected by the condition of communications. Blocked highways have brought transportation almost to a standstill. The major port of Puerto Barrios lost one of its piers and several of its other facilities are paralyzed. And while power was restored to the capital and other major centres within five days after the quake, some towns and villages are still without it.

Health service installations suffered heavy damage. Fifteen hospitals and 55 health centres were affected, representing 4,700 beds — or 60 percent of the country's hospital capacity. With the aid of other countries, however, the health service was quickly restored to almost the total capacity required in an emergency. In hospitals, clinics and health stations in the affected area some 75,000 people have been treated for injuries — a statistic that illustrates not only the dimensions of the tragedy, but also the efficiency of the social security organization and the Ministry of Health.

The earthquake's ravages have also

been felt in the cultural wealth of the country. Some historical ruins and buildings of great architectural value were damaged or destroyed, and libraries and important art collections were also damaged.

Some 250,000 students will be affected this year by the complete or partial destruction of school buildings. Again rural schools and those in poor urban areas are most affected.

In regard to handicrafts, the means of subsistence of many of the country's Indian people, the quake has hit their already precarious economy hard. Weavers, woodworkers and potters have lost their work materials. Their value, and the time it will take them to recover, are incalculable costs.

The earthquake destroyed 222,024 homes — or 34 percent of the houses in the affected area, representing 20 percent of all the housing in the country. But the number of homeless families is even greater. In the capital the 60,000 homes destroyed are mostly those of the poor. According to a poll taken by the SIAP project many of these homes house two or more families. This leaves approximately 90,000 families homeless in the Guatemalan metropolitan area alone.

The social costs of such a disaster are high, especially since the monetary cost of rebuilding the houses is usually beyond the reach of the affected families. In other words, the material bases of daily living — work and buying power — have been radically affected. The tragic consequences are obvious: rural migration to urban areas, squatters, misery and new slums. □



Photo: J. Valle-Riestra

Ethiopia maps the danger zones

Africa's Great Rift Valley slices through the heart of Ethiopia, from the Red Sea in the North to the Southern border with Kenya. Within this seismic fault system, the junction of three active rift zones — the Ethiopian Rift, Red Sea Rift and Gulf of Aden Rift — lie many of Ethiopia's important cities.

Seismic activity is frequent in this region. In Ethiopia alone, this century, the city port of Massawa was destroyed by earthquakes in 1921; in 1961 three thousand tremors were recorded from the centre of Wollo province, opening a fissure 20 kilometres long on the slopes of the Borkena graben and severely damaging villages and roads; in 1960 the village of Serdo in the Danakil desert was destroyed and 40 people killed.

Yet Ethiopia has no set of construction standards to minimize the vulnerability of its buildings. Until recent years damage, outside the larger cities, was slight: traditional houses, made of adobe reinforced with eucalyptus frames and roofed with thatch, could withstand most shocks. Today, however, experts are viewing with some alarm the erection of highrise buildings on the edge of major tectonic faults.

The destruction of Managua, Nicaragua, in December 1972 by earthquakes of an intensity experienced in Ethiopia every four to five years underlined to the Ethiopian government the importance of drafting building security codes. In 1973 the Ministry of Public Works requested the assistance of the Geophysical Observatory of Haile Selassie I University in preparing seismic maps and in estimating possible seismic risks for each sector of the country.

The director of the observatory, Dr. Pierre Gouin, a Canadian, had for 15 years been involved in cataloguing seismic activity in Ethiopia. Scanning through historical documents wherever they were to be found, he had recorded close to 500 events (an "event" can be any recordable seismic disturbance from a minor tremor to a major quake) covering the years between 1400 and 1974.

The task had not been easy: historical data was biased towards the north of the country where, in Eritrea and Tigre, monk-historians had kept records. Although the south of the country is believed to be as active, only legends — and the still active Rift Valley — were available to document events.

Other problems cropped up. Isoseismal maps made by an Italian, De Castro, of the 1906 earthquakes near Addis Ababa could not be found. Dr. Gouin doubts their validity in any case: "How could one estimate the possible damage when there is nothing to be damaged?" he says.

Events recorded by the one seismic station in the country gave no indication of the location of the epicentres or of the maximum intensity felt during the events. And although a seismic station had been installed at Asmara during a particularly active period in 1913, the seismograms had been lost during the first world war.

With IDRC assistance Dr. Gouin set out to complete the data and then list each event on computer cards. As Ethiopia has no computer facilities capable of handling the computations, this stage was carried out with the participation of the Victoria Geophysical Observatory in Victoria, Canada.

The resulting documentation includes plots of epicentres in the Horn of Africa, computations of intensity for 258 points in Ethiopia for the period of 1630 to 1974, as well as for the release of energy and strain over the whole country. The probability of seismic hazards for periods ranging from three to a thousand years was also determined. Dr. Gouin jokingly measures his 18 years of painstaking work by the close to 100 lbs of computer print-outs he carried back from Victoria.

Now back in Ethiopia Dr. Gouin is analyzing the computer results. The final report is expected this year to which will be appended seismic risk maps detailing at a scale of 1:1,000,000 the location of epicentres and intensity of tremors, the crustal profile, the acceleration and intensity of energy release and seismic zoning.

The project's most significant impact is expected to be on civil engineering work. Urban buildings such as schools, hospitals and bridges will be erected on more secure foundations. The specifications devised as a result of the project may also have applications to structures in the countryside such as dams.

A long and difficult task anywhere — it took Canadian seismologists 17 years to revise the 1953 Canadian seismic risk map — the preparation of seismic zoning maps is considered of primary importance in Ethiopia, now in the process of relocating its provincial capitals. And while Dr. Gouin warns that these maps are preliminary and will need to be revised as new information is found, they may help Ethiopia avoid the disasters that Guatemala has recently endured. □

The poor cannot afford expensive anti-earthquake construction, so low-cost housing suffers the greatest damage (left).



The Rift Valley in Ethiopia (right) — it also passes through many of the country's major cities.

Photo: Neill McKee

Making the most of Asia's small farms

Edward J. Weber

Millions of Asian families earn their livelihood and sustenance from small plots of land on which they cultivate their staple food, rice. As populations grow, however, greater pressure is being put on these people and their land to produce sufficient food just to feed themselves, with very little left over.

Multiple cropping is one way of intensifying production from the same land and it has been practiced and refined by farmers in many locations for centuries. It has only been recently, however, that these intensive multiple cropping systems, often considered "subsistence" as opposed to more "modern" commercial or cash crop techniques, have begun to receive serious attention from the scientific community concerned with improving agricultural production and thereby, rural welfare. Since its inception, the IDRC has been actively involved in this kind of work and one of the first and largest continuing programs receiving IDRC backing is at the International Rice Research Institute (IRRI) in the Philippines.

The Institute has been directly involved in some form of multiple cropping research since 1968, with the objectives of developing intensive diversified systems of food crop production that could maximize the use of land, solar radiation and water. This program was reorganized and intensified in 1972 when the IDRC assumed major financial support for it in conjunction with a related extension-oriented multiple cropping research project at the University of the Philippines Los Banos College of Agriculture close by. These cooperative efforts have now been expanded and linked into a still growing Southeast Asia regional network of research projects concerned with making biological research results more relevant and applicable to the needs and methods of the small Asian farmer.



An experimental windmill water pump at IRRI — but most farmers must depend on rainfall.

Multiple cropping or cropping systems research in this network is aimed at the more efficient use of resources that are available to the small farmer. The research approach being used at IRRI and in the associated projects of the network is first to come to an understanding of the existing systems operated by farmers before trying to determine what changes should be made. This is particularly important with traditional cropping systems since the components in these systems are so interdependent. In the past, much of the so-called "Green Revolution" technology failed to meet expectations for rapid spread among small farmers over wide areas because these interdependencies were not sufficiently considered, and the new technology was more adapted to ideal conditions than to the constraint-ridden situation of most small farmers.

Small Asian farms are, for the most part, characterized by a diversity of crop, animal and off-farm activities all of which contribute to the cash flow of the farming system. It has been normal practice for scientists developing agricultural production technology to pay attention only to the field areas where major crops are grown. However, there is often an additional homestead production area surrounding the house or farmyard where the farm family lives. This area is normally planted to a wide assortment of crops that contribute diversity and quality to the family's diet. The relative importance of this area to the family depends on both farm size and its cash flow, but for a low-income subsistence farmer the homestead is as important as his cultivated field area.

A great majority of the small farms in East and Southeast Asia depend on rainfall and only partially on irrigation to supply the water needed to grow their rice crop. In most instances only one crop is harvested even where partial irrigation is available. It is these areas that offer considerable potential for increased production through intensive cropping and thus form the major focus of IRRI cropping systems research. In most years two crops of rice, or at least rice followed by an upland crop, are possible if new procedures can be introduced.

Normally farmers wait until the monsoon rains have deposited enough water on their fields so they can puddle the soil and transplant young rice seedlings into the resulting water saturated mud. With new early-maturing rice varieties, however, it is possible to plant rice seed directly into non-puddled soil at the start of the rains in regions where the monsoon starts gradually. Direct seeding eliminates the traditional long wait until the monsoon is well established then puddling and transplanting which can use up to five months of good rainfall for a single rice crop. The new method permits

Photos: Neill McKee

The traditional method of transplanting of rice seedlings must wait for the arrival of monsoon rains.

growing two short season rice crops during the rainy period, since the first one can be harvested soon enough to allow time for a second to be transplanted in the normal fashion.

Where the rains begin suddenly rather than gradually, direct seeding is not possible and transplanted puddle rice must be grown. In many areas, however, there is still enough moisture available after the rice has been harvested to plant another crop such as a vegetable or various kinds of legumes. The potential number of combinations of crops, crop varieties, economic factors and climatological and physical characteristics that could be considered is mind boggling, but it is the task of the cropping systems research program to sort these out and come up with potentially more productive crop combinations or patterns than those farmers are presently using. The methodology being developed to do this is novel and interesting in itself.

Since the physical conditions under which small farmers grow their crops vary so greatly from place to place throughout the Southeast Asian region where this cropping system program is concentrated, IRRI scientists began by organizing an agroclimatic study in the region to define the physical basis for various cropping patterns. More specific studies in the Philippines, Bangladesh, Sri Lanka, Thailand, and Indonesia were undertaken later as part of specific associated country programs. Information on soils, rainfall, solar radiation, temperature variation, topography, water supply, and other factors was gathered and compiled to delineate agro-climatic zones where particular combinations of crops and cropping practices would most likely be successful. IRRI has coordinated these mapping and data gathering efforts on a region-wide basis to permit the selection of research sites in key zones, the extrapolation of results across zones, and the application of local research



data to similar zones elsewhere in the region.

Agroclimatic surveys were just the start. Much more information was needed on small farms and on the farmers themselves as well as a means of more quickly determining whether research results they were obtaining would be useful to the farmers or not. A four-step approach has evolved through experimentation, and a good deal of time spent in farmers' fields, by the scientists who are attempting to develop appropriate technological packages which can improve the production and thereby the well-being of farm people.

The first step is to observe and describe the environment as well as the

farmers' operational systems and constraints in fairly precise terms. Economic factors are especially important here as they relate to the supply of farm labour over the year, markets, cash flow, farm size, cost and availability of animal or mechanical power for land tillage, etc. The gathering of this information and relating it to the requirements of potentially more intensive cropping patterns leads to a better understanding of the constraints faced by the farmer under his particular conditions.

Armed with this information, the researcher can then move on to the second step, the design phase, in which he attempts to put together improved cropping patterns to make more effi-



Data analysis at IRRI headquarters: a better understanding of the constraints faced by the small farmer in Southeast Asia.

cient use of the farmers' available physical and other resources. In order to do this, he must have a source of improved component technologies such as better plant varieties, pest and weed management recommendations, new crops, etc. Potentially feasible cropping patterns are matched with socio-economic resource requirements to make sure that there are no bottlenecks which the farmer will not be able to overcome. A number of alternative cropping patterns from which the farmer can choose are likely to be necessary.

Once potentially improved systems are designed comes the third step: they must be tested out in the environment for which they are intended. They must be taken to farmers' fields where they can be observed not only in the exact physical environment where they may be used but also under the management constraints that the farmer himself faces. This is a very important part of the cropping systems research approach which can best be illustrated in more detail by an example.

Approximately 50 farmers from four villages agreed to grow one or two potential new cropping patterns in addition to their own crops. Each pattern was to occupy an area large enough so that realistic labour and power used for cultivation data could be collected. It was carefully explained to the farmers that they were part of a research program and that nothing was being extended or demonstrated. All methods and practices were reviewed by the farmers before planting. They were encouraged to choose the crop patterns they wanted to try from the list of possibilities provided by the scientists. This participation in research intrigued the farmers, many of whom made their own suggestions for im-



Under the palms a healthy sorghum crop follows the traditional rice crop.

provements or changes — for example, the farmers insisted that the row spacings based on research station findings were too wide and would make weed control difficult. Incentives in the form of seed, fertilizers, and insecticides were given, but only as called for in the experimental outline. The farmers agreed to provide all power and labour and to harvest the crops in the same way they would their own. No crop guarantee was given. The farmers assumed all risks involved. Each farmer was also asked to keep a daily record on a form provided to him on what he did to the field and how long it took. In the end the harvest went back to the farmer after yield measurements and other experimental data were recorded.

The fourth step in this integrated applied approach to cropping pattern development is extension. Involving extension workers in the research program early on can minimize the problems of interagency transfer of results and information later. Having been involved in the development of crop-

ping pattern recommendations and having seen farmer reactions to them in the early stages, extension agents will be better able to understand and explain these patterns to farmers who are potential adopters. This linkage also leads to rapid feedback of problems in the field to researchers and planners in a responsive system whereby each season's experiences are translated into next season's research and project redesign.

IRRI has done considerable work on developing cropping systems research methodology, but its main focus must be on providing the component technology of improved plant material and agronomic practices for potential systems which can be adapted in national programs. To encourage local adaptation of these results, the IDRC has provided support for a number of national cropping systems research programs which are now deeply involved in developing and adapting cropping patterns and systems for regions in their own countries. Support has been provided for programs in Sri Lanka, Bangladesh, Thailand, Indonesia and the Philippines, oriented to the specific needs of these countries but linked closely to IRRI. In addition, a project was funded at the University of the Philippines to screen a large number of varieties of upland crops used in cropping patterns and then sending the most promising of these to the other country programs for local adaptation trials and incorporation into potentially more productive cropping patterns.

In order to coordinate the work in all the country programs and that of IRRI, a working group has been formed of the program leaders from each of the country programs. This working group meets twice a year to exchange information on research results, discuss future plans, exchange experiences and examine new ideas. Such meetings provide opportunities for country program representatives to learn from each other in a way that would not be possible if their only links were with IRRI personnel.

A good deal of progress has been made in multiple cropping systems research over the past five years but much still remains to be done. An important concern, however, is to make the whole program a regional one in which national programs are equal participants in developing the required technology while cooperating with IRRI which is acting as the hub of the network. □



Field testing the improved systems under farm conditions — the farmer and his wife manage the system themselves, take all the risks and reap the benefits.

Edward J. Weber is a program officer with the IDRC's Agriculture, Food and Nutrition Sciences Division based in Ottawa.

The Captain takes a new tack

Clyde Sanger

Among the neat-suited diplomats and slightly tired lawyers who pace the corridors and cluster in committee-rooms of the United Nations in Geneva and New York, Edgar Gold makes a striking figure. He has never been a diplomat and, although he is now a law professor, he came to that position only recently and by a curious route. Rather, with clipped beard and blue eyes, a breezy style fuelling a big frame over 6 ft 3 in height, he looks like a legendary sea-captain under full steam.

Which is not too surprising, because for 16 years he indeed steamed round the world's oceans in the merchant ships of half-a-dozen countries, starting as a cadet fresh out of an Australian high school. It has been a lengthy voyage from those first visits to Pacific islands to his present moorings in Halifax, where he is helping establish the Dalhousie Institute of Ocean Studies, or to New York's Turtle Bay, where he was keeping a sharp eye in May on the latest round of the Law of the Sea Conference. But there is probably more logic and direction — and drive — in that life's journey than there is in the meanderings of most of us.

When he came into the sights of IDRC telescopes in 1973, he was Captain Edgar Gold and he was working, in any spare time he had, on an M.A. thesis on German legal philosophy, which he has yet to complete. What he really wanted to do was to study marine policy in various African and Asian countries, and an IDRC Research Associate award helped him on his way for two years.

He had plenty of qualifications by then. After getting his Second Mate's papers in Sydney, he had switched to the British merchant marine and progressed up to Master. Along the way he had been a chief officer on Zimlines and, because Israel had technical assistance programs with African states, he had spent five years with the shipping lines of Ghana. Ghana's Black Star line he remembers with respect: the handsome harbour of Tema that Kwame Nkrumah built, the modern ships and the well trained crews. He spent another year working out of Port Sudan where conditions were tougher: the heat was oppressive and the Sudanese were struggling in those days with third-hand tonnage and equivalent crews. Things have improved since, he adds.



Edgar Gold: from ship's captain to lawyer and diplomat.

On one trip he steamed into Halifax with a cargo of Jaffa oranges and met a medical student called Judith Hammerling. They were married later, and for two years she sailed with him as ship's doctor. One of his vessels, the *Lakhish*, had a crew of 30 drawn from 12 nationalities not so unusual, he says, since 70 percent of the Israeli marine were foreigners.

Where to go, having done all this by 33? He was getting tired of being "a sophisticated ship's chauffeur" and wanted to "go and influence decisions". Working for developing countries, he saw how the old maritime powers squeezed them on freight rates and other shipping rules. He thought he would learn some law, while his wife did a residency as a psychiatrist.

It took longer than the year for which he had budgeted. He had first to get a B.A. (in political science and languages) and then an LL.B. at Dalhousie. But this gave him time to learn at first-hand about marine oil pollution problems, as clerk to Mr. Justice Hart in the 1970-71 commission of inquiry into the incident of the tanker *Arrow*, which spilt its oil around Chedabucto Bay after running aground. Four years later, when he was observing the Law of the Sea Conference session in Caracas and word came that the tanker *Metulla* was aground and spilling 60,000 tons in the Straits of Magellan, he could tell Latin American delegates what that really meant.

In his two years as a Research Associate, he visited eight countries in Africa and five in Asia and attended the Caracas and Geneva sessions of the Law of the Sea Conference. He also attended a conference in November 1973 convened by the Inter-Governmental Maritime Consultative Organization (IMCO) at which representatives of 79 countries discussed problems of marine pollution. He based himself at Cardiff, where the University of Wales Institute of Science and Technology was building up a centre for research and training in port and transport administration.

He found that African countries were just beginning to get nervous about the state of their coastal waters. Previously pollution had been regarded as "another rich man's thing we don't have to worry about". But Kenya, he discovered, was starting to fear for its beautiful coastline and to trace the pollution back, mostly to the tourist hotels and shoreline settlements that dumped their waste in the ocean. Kenya, and the West African states too, began to size up the hazards from all the coastal shipping.

He is convinced that, despite the slowness of progress at Caracas and Geneva and New York, there will be some sort of Law of the Sea treaty within a couple of years. So, although the team at Dalhousie who are planning the Institute of Ocean Studies (DIOS) put some immediate emphasis on conference diplomacy studies, the study of ocean resource management rates higher in their longer-term plans.

The Institute is a multidisciplinary effort, drawing in the Faculties of Law and of Administrative Studies, and the Departments of Economics, Political Science and Oceanography of the University. As the list implies, it will take a broad approach to marine policies, complementing Cardiff's concentration on administration and an emphasis on fisheries being developed at the new marine policy centre in Seattle. Each centre will carry out research, and offer training courses, that are designed to benefit developing countries. Dalhousie's Centre for African Studies may tend to tilt some of the work towards that continent, but a balance will be kept by another leading spirit in the Faculty of Law and DIOS, Professor Doug Johnston, whose scholarship has centred on Asia. And in September, when DIOS is launched, the first course will probably be for biologists from the Caribbean.

Many hands are helping launch the institute, and Edgar Gold would not claim his was giving it the biggest push. Nevertheless, one might marvel at what extraordinary results followed from the shipment to Halifax, years ago before anybody was talking about 200-mile economic zones, of an apparently ordinary cargo of Jaffa oranges. □

'You have found the ideal formula'



Photo: Neill McKee

A little over a year ago a new periodical appeared on the newsstands of the French-speaking countries of West Africa. Entitled *Famille et Développement*, the publication represents a unique venture into the field of development education in the region.

Pierre Pradervand, of the IDRC's West African Regional Office in Dakar, Senegal, a Swiss sociologist with eight years' African experience in the field of research and information, is managing editor of this Centre-supported project. In the following article he describes the reactions to the new publication, and how it came into being.

A recent letter received by the editors of *Famille et Développement* started thus: "... You cannot imagine all the good this publication does for our youth. You have found the ideal formula. I will take 10 subscriptions for my students."

A young chemist from Chad recently wrote: "Your periodical... offers an abundant source of information which is simple, clear and precise, at a price anyone can afford."

A school director from the Republic of Benin (formerly Dahomey) expressed similar enthusiasm: "This publication arrives at just the right moment for our continent in its quest for information of an educational nature. *Famille et Développement* will be one of the most interesting tools in our educational institutions and a most efficient means for the development of the African countries, due to its content and presentation."

How is it that just a year after the first issue readers' mail is 100 percent favourable (a factor that even the editors would be skeptical about if numerous other factors did not point in the same direction) and *Famille et Développement* is already widely known in the region? There are a number of reasons.

Famille et Développement is a quarterly, illustrated periodical on development problems, with special emphasis on family health, started and financed by the IDRC in response to the huge need for information on these issues at the grass-roots level in this region of Africa.

Information of an educational nature has been possibly the most neglected area of development in the Third World, and Africa is no exception. Yet it should be evident that people cannot adapt adequately to new situations and institutions without a minimum of information as to the "whys" and "hows" of such changes. This is the need *Famille et Développement* attempts to fill.

The project was started only after a very careful evaluation of the real needs. This evaluation included a mailed questionnaire; a meeting in Dakar with 24 participants from 11 countries to determine content, format and title of the

periodical; contacts with high-level officials from 10 countries; and, last but not least, a trial issue published in October 1974.

The editor-in-chief of the publication is Marie-Angélique Savané, (above) a Senegalese journalist, while another Senegalese, Charles Diagne, is responsible for design and production. They are assisted by an eight-member editorial committee composed of representatives of Mali, Upper Volta, Ivory Coast, Togo, Benin, Cameroon, Congo and Zaire. The committee meets yearly in Dakar and is the publication's policy-formulating body.

Articles are mostly written by Africans from the region and cover a wide variety of topics: preventive health and health education, clitorrectomy (issue No. 2 contained one of the few articles on this topic ever published in an African periodical), traditional contraception, unemployment, teenage abortion in schools (a serious public health concern), drought in the Sahel, Chinese barefoot doctors, the dangers of skin bleaching products, drug abuse, etc.

Great care is taken with the layout and photography to make the magazine attractive and to enable it to compete with others on the newsstands.

Success is always hard to define objectively, especially in the area of educational inputs. However, in this case there are some objective indicators of the magazine's appeal. Sales are steadily increasing, and in some areas even used copies have been selling for twice the usual price. Radio stations and newspapers throughout the region are picking up whole articles and using them. In Mali it is reported that even illiterate drivers of the ministry of agriculture were buying it to be read to them by members of the family. Ministries of education — specifically in Togo and Ivory Coast — consider it a valuable educational tool, and training institutions are taking out multiple subscriptions. Distribution has been extended well beyond the usual level of the capital city and a few major towns or villages. Even though there has been little or no publicity, newsstand sales are increasing regularly, and paid subscriptions are coming in at the rate of 500 to 600 a month, certainly a healthy sign.

But maybe the most significant sign of all is the high degree of identification with the periodical shown by the considerable number of readers who wrote in after the trial issue referring to "our journal".

The IDRC's present financial support ends in December 1977. It is hoped that in the long run *Famille et Développement* will be taken over by an African organization and become a truly African journal. □

New Publications

DEVSI — the preliminary design of an international information system for the development sciences, prepared by the DEVSI study team. Published May 1976, 247 pages, IDRC-065e.

This report explores the existing services that attempt to provide information relevant to development, and concludes that the only way to provide comprehensive, continuous and reliable service is to establish a cooperative international system. Options are presented for the organization, management and phased implementation of the system.



CATASTROPHE OR NEW SOCIETY? The Latin American World Model, by Amílcar O. Herrera, Hugo D. Scolnik, Graciela Chichilnisky, Gilberto C. Gallopín, Jorge E. Hardoy, Diana Mosovich, Enrique Oteiza, Gilda L. de Romero Brest, Carlos E. Suárez and Luis Talavera. Published June 1976, 108 pages, IDRC-064e.

This publication is reviewed in an article by Clyde Sanger beginning on page 3 of this issue.

FOOD LEGUME PROCESSING AND UTILIZATION, by Alvin Siegel and Brian Fawcett. Published May 1976, 88 pages, IDRC-TS1.

This is the first in a series of technical studies to be published by the IDRC. The authors, both IDRC staff members, place special emphasis on the developing countries in this study, and conclude that there are many aspects of food legume processing and utilization that merit further research. Such research should concentrate on developing inexpensive, acceptable, nutritious and easily prepared food products.

THE INTERNATIONAL EXCHANGE AND TESTING OF CASSAVA GERM PLASM IN AFRICA, Eugene Terry and Reginald MacIntyre, editors. Published June 1976, 60 pages, IDRC-063e.

This is a report on the proceedings of an interdisciplinary workshop held at the International Institute for Tropical Agriculture, Nigeria, in November 1975, and represents the latest in a series of reports on cassava research published by the IDRC. In addition to theme papers and individual country presentations, the report includes appendices on various aspects of the workshop theme.

ANDEAN PACT TECHNOLOGY POLICIES, prepared by the Junta del Acuerdo de Cartagena. Published June 1976, 60 pages, IDRC-060e.

The six member countries of the Andean Pact — Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela — recognizing the role and implications of technology in the development process, specifically introduced technology policy as one of the essential components of the integration process in the Andean subregion. This report presents an outline for a subregional action program in technology policy.

TECHNOLOGY POLICY AND ECONOMIC DEVELOPMENT: a summary report on studies undertaken by the Board of the Cartagena Agreement of the Andean Pact Integration Process, prepared by the Junta del Acuerdo de Cartagena. Published June 1976, 108 pages, IDRC-061e.

This is the second Andean Pact publication, and gives details of some of the studies undertaken with the support of the IDRC.

EDUCATION RESEARCH PRIORITIES: a collective view, Published May 1976, 27 pages, IDRC-068e.

This report was prepared by the IDRC as part of the broader effort of the Bellagio Consortium on Education to examine assistance to education. Based in part on the outcome of meetings in Africa, Asia and North America, it emphasises the creative directions that research could now take to provide better education to more people, despite minimal resources, by involving policymakers in the research process, and by aligning research more closely with local conditions and needs.

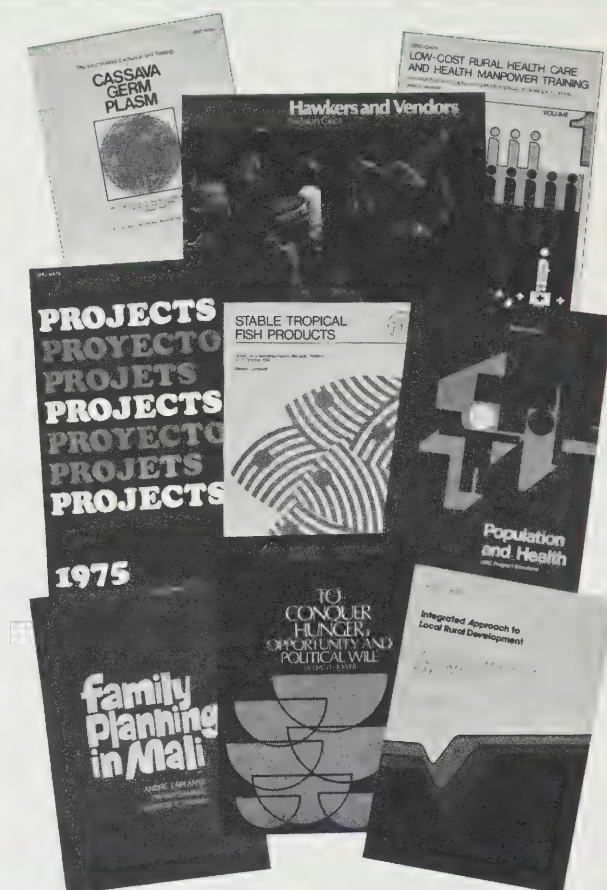
For more details on how to obtain these and other IDRC publications, see advertisement on the back cover of this issue.



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In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population and health, information sciences, and social science and human resources. A list of past and current publications is available on request.

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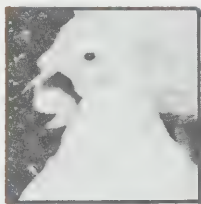
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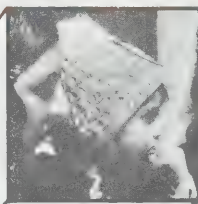
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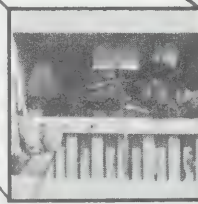
Health8



Cattle10



Habitat12



CONTENTS

Versatile cassava is at home in Asia

Asia's challenge to the world's major cassava producers, by Douglas W. Wholey 3

Satellites provide down-to-earth data

Report on how space science is aiding development, by Robert LeBlond 5

African universities face a daunting challenge

The universities' role in Africa's future, reviewed by J. M. Léger 7

Health care for the most people

Alexander Dorozynski reports on Iran's village health worker program 8

Combined effort combats African cattle killers

Photo feature 10

Habitat — the end of the beginning?

A retrospective look at the Human Settlements Conference, by A. A. Laquian. Clyde Sanger reviews activities at the Habitat Forum 12

Development must start at the grass-roots level

Commentary, by Nihal Kappagoda 16

Briefs

People, projects, events 18

New publications 19

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Cover photo by Neill McKee: clean water is a priority for Iran's village health care program. See article page 8.

Versatile Cassava is at home in Asia

Douglas W. Wholey

The words "food" and "rice" are synonymous in most parts of Asia, so at first sight it seems strange that a root crop should be commanding attention in the lowland tropical areas of the continent. Even more strange when one considers that Indonesia will harvest around 10 million metric tons of a crop that was only introduced into the country a little over 100 years ago. Enough has been published by IDRC recently to enable me to give the reason for the attention being paid to cassava very briefly: it is a very efficient producer of carbohydrate.

The diversity of uses to which this carbohydrate is put almost reflects the diversity of the societies producing it. In India the majority of the national cassava crop is for human consumption, whereas in Thailand most of the crop is exported to Europe for animal feed. In Indonesia, where the crop's value as human food was first fully realized during rice shortages between 1914 and 1918, low labour costs are enabling the country to enter into the European animal feed market on a rapidly expanding scale. Exports of pellets from Sumatra have expanded from 3,000 tons in 1967 to an expected 200,000 tons this year. In Malaysia, comparatively higher labour costs will make it very difficult to export to Europe at present prices, but rather than sell the

commodity to feed someone else's animals, Malaysia intends to feed cassava to her own expanding livestock industry, thereby reducing the import bill of more costly feedstuff components, such as maize. However, not to be pushed out of the export market, Malaysia has an expanding trade in cassava starch, pearl and flake, which command higher export prices than animal feed.

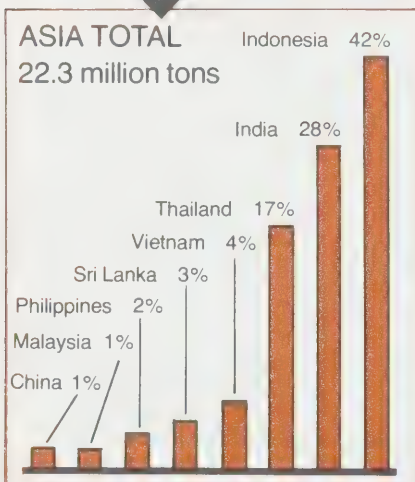
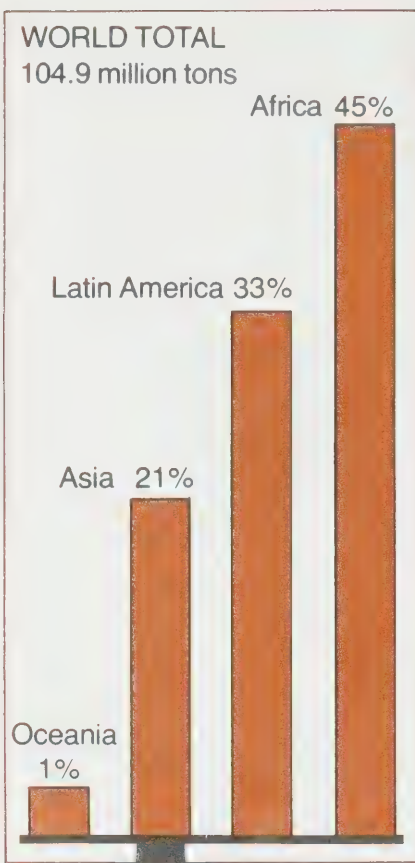
Just how does Asia, the newcomer to cassava production, compare with the rest of the world? According to the 1974 FAO Yearbook, Asia is breathing down the neck of Latin America, the home of the cassava crop (see Table). However, both these continents are losing ground to Africa, where cassava production is rapidly increasing in the traditionally root crop consuming West African countries of Zaire and Nigeria. Indonesia has been pushed out from second world producer of cassava after Brazil, to fourth place by these two African countries.

Enough of statistics. What has been done in the past to promote the production of cassava in Asia? Surprisingly little in fact. Rather the opposite in some countries, for example, in Malaysia, it was taught in agricultural college that cassava depleted the soil to such an extent that no other crop would flourish if planted after cassava. It was



Cassava fertility trials at the Malaysian Agricultural Research and Development Institute.

Photo: Neill McKee



Indonesian women with a display of cassava food products.

written into tenancy agreements that cassava should not be planted on the land. Some isolated research by national departments of agriculture and universities can be found in the literature, usually representing the interest of one individual for a short period of time. However some quality agronomic research has been carried out in the region, particularly in Indonesia before World War II and in Sri Lanka towards the end of the war.

The first serious attempt to set up a continuous national program of cassava research was in India, with the founding of the Central Tuber Crops Research Institute (CTCRI) at Trivandrum, Kerala State in 1963. In Thailand, the only cassava research until recently was carried out by the Ministry of Agriculture, and was solely agronomic in nature. Similarly in Malaysia and Indonesia, the little cassava research that was going on was handled by the Department of Agriculture and the Central Research Institute for Agriculture respectively.

However, a change is coming to the cassava-producing countries of Asia. Multidisciplinary national programs are being set up by governments, and universities are becoming more involved. The Malaysian Agricultural Research and Development Institute (MARDI), set up in 1969, is currently staffing and equipping a team of cassava research workers with assistance from IDRC. This team will breed and select new varieties, and develop better production systems amongst other objectives. Team members will spend periods at the International Centre for Tropical Agriculture (CIAT) in Colombia, which is devoting particular attention to cassava. They will work with CIAT



In Thailand chickens are fed on an experimental cassava diet.

scientists and gain experience with the crop in its "home environment". In the Philippines the Council for Agricultural Resources Research has recently set up a long-term root crop program and IDRC has been asked to assist during the initial stages.

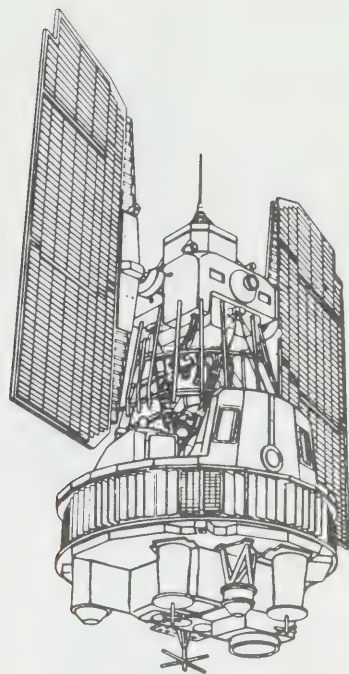
In Thailand attention is being directed towards utilization of cassava as well as production. At Khon Kaen University a team of animal scientists is looking into feed-quality aspects of cassava chips with IDRC support. It is hoped that the results of their research will demonstrate the value of producing better quality animal feed from cassava. Along similar lines, the Asian Institute of Technology in Bangkok, with funds from IDRC, is looking into inexpensive means to improve the sun-drying techniques used in the manufacture of cassava chips, and better pelleting methods, again aimed at improving product quality.

Apart from research to expand or improve upon existing systems, IDRC is also funding innovative research on cassava. At the University of Malaya, Kuala Lumpur, a team is looking into the microbial enrichment of cassava, as a possible means of increasing the protein content, and its subsequent use as an animal feedstuff. In Java, Indonesia, Brawijaya University is investigating a novel practice developed by a local farmer 20 or so years ago. *Manihot glaziovii*, a "tree cassava" brought from its native South America as a potential latex producer, but widely adopted as a shade tree growing on the sides of the roads, is grafted to cassava increasing the yield of roots by up to 100 percent. This "Mukibat" method, named for the man who first developed the technique, may indirectly hold a key to the physiological processes leading to high-yield in cassava.

To date, IDRC has donated \$1,330,400 in support of seven cassava-related projects in Asia. In order to coordinate the activities of these and other cassava projects in the region CIAT will soon be placing a staff member in Asia. In this way research findings and improved varieties will become more readily available and production problems can be channelled to projects within the region or to CIAT for solution. This important step in the structuring of a cassava network for Asia, is similar to one already initiated by CIAT for Latin America, both of these "outreach" activities being supported by IDRC. With this increased attention on cassava research, who knows maybe Asia will outstrip South America in cassava production by the end of the decade? □

Douglas Wholey is an IDRC research advisor with the Malaysian Agricultural Research and Development Institute in Selangor.

Satellites provide down-to-earth data



Robert LeBlond

A detailed knowledge of available natural resources is essential to the successful implementation of any planned program of development. To survey and inventory such resources is not an easy task, however, particularly in inaccessible mountain or desert regions. Conventional field surveys or low-altitude aerial surveys are both time-consuming and expensive. In many developing countries, these restrictions result in a lack of detailed information, and thus hamper development.

Over the last decade, the development and increasing utilization of remote-sensing technology and a program of international scientific cooperation have brought these countries a valuable tool. The term "remote sensing" has long been applied to numerous techniques for observing the earth from platforms such as high-altitude aircraft, rockets and satellites equipped with photographic or electromagnetic scanning devices. At the international level, remote sensing took a giant leap forward in 1971 with the launching by the US National Aeronautics and Space Administration (NASA) of the first Earth Resources Technology Satellite, ERTS I. Another similar satellite, LANDSAT II, was launched in February 1975.

Circling the earth at an altitude of 915 kilometres, LANDSAT II collects and transmits data to receiving stations around the world. The resulting information is available in two forms: recorded on magnetic tape, or in multispectral photoimages reconstituted by a process of conversion from the recorded data.

LANDSAT images are recorded on magnetic tape on four spectral bands. In the receiving stations, the data are then processed to produce pictures, each

covering an area 185 kilometres square. Examination of the shades and colours of the images obtained from the four spectral bands, alone or superimposed, yields information on geology, geomorphology, hydrology, vegetation and soil utilization. Such information is particularly useful in the preparation of the small-scale thematic maps that are often needed in programs of natural resource prospecting and regional planning.

The use of a satellite to gather data has an additional advantage: its orbit takes it along the same path once every 18 days. This makes it possible to take readings at regular intervals over a given period, and thus to observe seasonal variations.

After the launching of the first satellite, NASA introduced a program of participation in this research activity, and announced its willingness to supply ERTS data and images to all genuinely interested researchers. Beginning in 1971, almost 40 proposals were submitted by scientists in the developing countries. Further impetus was given to this new information technology by the United Nations Space Applications Program. The World Bank and the FAO began to use it in their projects.

Sudan was one of the first African countries to take advantage of NASA's offer, and in 1972-73 received some 725 ERTS images. Using photo-interpretation and digital processing techniques, Sudanese scientists worked with an FAO team on an analysis of the resources of the province of Kordofan, southwest of Khartoum, which has been designated as an agricultural development region.

The encouraging results from this preliminary work have led the Sudanese government to establish a

centre for ERTS applications that can handle requests for specialized thematic mapping. The question arose, however, as to how this research facility was to be set up to respond to the needs of the various ministries and agencies concerned. There were two priority areas: the training of Sudanese researchers, and applied research. These offered a twofold solution to the country's problems, and made possible the preparation of thematic maps for rural development.

At a fairly early stage in its development, the IDRC realized both the need for and the potential of research into the applications of remote sensing technology. In 1974 the Centre's Information Sciences Division undertook exploratory discussions with researchers in Latin America and Africa who were able to make detailed suggestions for solutions to problems involved in learning this new technology.

Following these missions, and a seminar on the application of remote sensing to cartography, sponsored jointly by the UN and the IDRC and held in Brazil in November 1974, the Centre drew up a modest program of activity. Priority was given to applied research, such as the preparation of thematic maps on water, forest and agricultural resources. This approach seemed both more useful and more feasible, having in mind the capacities of the institutions concerned.

It was clear that exchanges of experts and the provision of technical assistance alone would not achieve success in this kind of research. The prerequisite for success seemed rather to be teamwork by a multidisciplinary group of local scientists — like the Sudanese team — skilled in geology, hydrology, ecology and agriculture. The members

of the group should also have a sound knowledge of the methods of photogrammetric analysis used in making topographical surveys.

The first Centre-sponsored projects were approved in early 1975, and involve the mapping of priority development zones in Sudan and Bolivia.

In Sudan, the zone in question covers 60,000 square kilometres of savanna near El Obeid. The abundant data gathered during preliminary work done in 1974 are being transposed onto a set of thematic maps indicating seasonal variations in pastures, soil and water.

In Bolivia, a unit of the government's geological service has recently begun a study of data relating to the basin of the Desaguadero River, which dissects the high plateau between Lake Titicaca and Lake Poopo. These geological studies are designed to locate alkaline rocks and diapiric salts that could contaminate the water and make the soil unfit for cultivation. Another goal is to identify land suitable for agriculture and livestock in the region, since the government plans to establish new population centres there.

This year, a third Centre-supported mapping project was begun in Tanzania; the purpose is to make thematic maps of the Rukwa region, in the southwestern part of the country. Rich in resources, the Rukwa region has a topography varying from plains to rugged plateaux. Its population is widely scattered, and there has already been a large-scale program to bring the people together in villages. The government of Tanzania has asked the Bureau of Resource Assessment and Land Use Planning (BRALUP) of the University of Dar-es-Salaam to develop a long-term integrated development plan for the region.

IDRC assistance will facilitate the assembly of a Tanzanian research team skilled in the analysis and classification of data obtained by satellite. With the equipment it has received and the experience acquired through this project, BRALUP should subsequently be able to embark on a full and detailed remote sensing program. As a member of the team has pointed out, their goals are not limited to making maps and training personnel; the experience they gain will also be most valuable in future decision-making on the application of technology to planning.

These projects, and two others in Mali and Bangladesh that are currently being considered, are similar in the procedure adopted. A preliminary analysis of the LANDSAT photoimages is undertaken, and members of the team make an on-the-spot inspection accompanied by a consultant. This enables them to verify the analysis of, say, the electromagnetic "signature" of a body of water indicated by the data.

Next comes a course of training in methods of transcribing the data onto maps. The Sudanese and Bolivian teams

have just completed three months of instruction at Purdue University in the US. The fourth stage consists of verification of the data compiled, and another field inspection.

Publication of the maps is the last stage in the projects. Since the areas studied generally do not exceed 80,000 square kilometres, each cartographical theme — vegetation, minerals, water resources — requires a set of only four or five maps on a scale of 1:250,000. The maps are in black-and-white, and 60 copies will be made of each. This very modest scale of dissemination of results, which is nevertheless adequate for reconnaissance maps, is expressly intended to suit the practical resources of the institutions concerned, and to provide a rapid response to local inventory and planning requirements.

The provision of equipment and the supply of scientific documentation and LANDSAT images will also facilitate the work of these research teams, even after completion of the projects with which the IDRC is associated. By virtue of their geographical diversity, these projects have the potential to establish a series of useful points of reference for many other developing countries. Similarly, the mapping objectives more appropriate to geology, hydrology, vegetation or land use will enable this research activity to become a genuinely multidisciplinary program.

To ensure that this potential is realized, a seminar is planned for 1978, which will bring together the local directors of the projects, who will be able to assess the work accomplished and draw up recommendations. In order to improve this particular form of technology transfer, there will have to be thorough analysis of such points as the make-up of research teams, the kind of training needed, the choice of operational objectives and the forecasting of results. These points will also have to be considered in relation to the ways and means of international and regional co-operation. The results of this meeting should increase the positive impact of this data-gathering technology on the implementation of the economic plans of the developing countries. □

Robert LeBlond is a program officer with the Information Sciences Division based in the Centre's East African Regional Office in Nairobi.

African universities face a daunting challenge

J. M. Léger



In the educational system being established, redefined and reshaped in the developing countries, the universities have — or will have — a key part to play in three activities: research, the training of managers, and promotion of the cultural heritage. In Africa, in particular, there is now a determination on the part of academic and political leaders alike to place the universities at the service of the nation and to integrate them fully into society. At the same time, it is within the capacity of the universities to help to generate a new concept of development that incorporates the difficult but vital reconciliation of African culture and technological progress.

In both English- and French-speaking Africa, universities began as more or less faithful replicas of British or French models. This stage was a brief one: 10 to 15 years on the average. Opposition to "imported" universities derived less from emotional factors than from a realization of the irrelevance of such institutions to the traditions and the social, cultural and economic circumstances of African society.

The growing clamour for reform was addressed not only to the universities, but to the educational system as a whole, and pointed to its inadequacy from the cultural, social and economic point of view. The resulting Africanization went beyond the mere substitution of indigenous teaching staff for foreigners, and embraced the very concept of education.

Generally speaking, Africanization of the senior administrative levels is now completed, and Africanization of the teaching bodies is progressing and should be completed in 10 to 15 years. The various radical and gradual changes in structures, curricula and methods are dominated by a two-fold

objective: relevance to national or regional needs, and reduction of the cost of education.

There is a striking proliferation of university-level institutes of technology and similar institutions. They constitute a first step towards countering the acute shortage of higher-level technical managers, a gap that is at present being bridged partially, and at great expense, by experts and technicians from abroad.

The new African universities are characterized by a research effort that is not only growing rapidly, but is geared to national objectives. The fact that a number of them now have doctoral programs in some disciplines, and others are gradually achieving this, obviously facilitates the carrying out locally of scientific work that young academics were previously compelled to do abroad. Similarly, the growing number of research centres and institutes is opening up new possibilities for young African scientists. Thesis topics now relate to African conditions, and research programs are defined and oriented more and more in terms of national policies.

This trend has been facilitated by the fact that many African countries have recently established their own scientific research and policy structures, with responsibility for co-ordinating all research activities and resources in order to shape them into a genuine instrument for development. There is also a strengthening of relations between universities and non-university research centres and institutes. The needs are so great and the men so few that academics are led to participate actively in state research institutions, as directors of national research centres, consultants to governments on specific projects, and so on. There is no

essential conflict between these different functions; the university, after all, is not considered external to the machinery of state, but is regarded as a vital element in the overall national apparatus for training, research and culture.

Say what we will, technology is not neutral. It carries within itself the society that produced it — and all that society's values, concepts and structures. The major problem of our time is to reconcile the vitality of national cultures with technological progress. In Africa it is the universities that hold the key. This is demonstrated by a number of significant developments: contributions to the effort to gather and transcribe oral traditions; the growing number of institutions teaching black African art and literature; the vitality of research into African society and history; and the activities of centres of applied linguistics, one of whose main tasks is to pave the way for the introduction of national languages in education.

In a few short years, the universities of Africa have assumed a major share of the burden of preserving and promoting the cultural heritage, in order to ensure a contemporary creativity that draws its sustenance from authentic African sources. Since the universities are also responsible for training teachers and have committed themselves to the demanding function of continuing education, they find themselves at grips with all the central problems of African society. The challenge they have taken up is indeed a daunting one.

In the search for solutions to the common problems of black Africa, inter-university co-operation is clearly imperative. Practised with mixed success in a wide variety of areas, and compromised sometimes by undue

haste, particularly on the political level, this kind of co-operation can perhaps be most readily, most fruitfully and most lastingly achieved in the cultural and scientific sphere.

A number of bodies are working to promote organized co-operation among African universities. The Association of African Universities has a system of grants to encourage student exchanges between French- and English-speaking countries. The Conference of Rectors of African Universities, in conjunction with AUFELF (the Association of Partially and Entirely French-Language Universities) approved in July 1973 what amounts to a charter for inter-university co-operation in Africa, and instituted two years ago a system of short-term exchanges for African university professors. It has also drawn up an inventory of the scientific potential of the universities, and is preparing an index of teachers and researchers. These two documents should foster the development of practical co-operation among the various institutions.

There are two other forms of co-operation that show particular promise. On the individual level, there has been a proliferation in recent years of pan-African cultural and scientific associations based on specific disciplines. Their seminars, talks and publications encourage a team approach and foster mutual awareness among African academics. On the institutional level, there is a strong desire to use the regional approach to eliminate duplication and prevent the dissipation of human and material resources. It is in this spirit that the Conference of Rectors has launched a study into the feasibility and possible structure of an African graduate institute for scientific studies that would provide a means of co-ordinating the division of labour on a continuing basis.

A decade or so from now, the universities of Africa will no longer have much in common with what they were 10 to 15 years ago. While retaining their universality in broad measure, they intend to become — and in part have already become — institutions at the service of African society with roots running deep into that society, and able to generate a response to the basic question: how to discover an overall method of development compatible with African civilization, one that not only preserves but strengthens the soul of Africa and the illustrious cultures in which it finds expression. □

Former journalist and foreign affairs correspondent, Jean-Marc Léger is Secretary-General of the Association of Partially or Entirely French Language Universities (AUFELF). This article was originally published in French in Le CRDI Explore Vol. 5 No. 2.

Health care for the most people

Alexander Dorozynski

The majority of people in the developing world have little or no access to modern health services. Worst affected are the rural people who live in remote villages cut off from the towns and cities where modern health facilities are available. In such communities even a very basic health service could bring a vast improvement, for most of their health problems are serious only if they remain untreated, and do not require either the attention of a highly-trained physician or the facilities of a sophisticated modern hospital.

The question facing most developing countries, then, is not how to build more hospitals or train more doctors (many of whom would probably prefer to remain in the cities or leave the country for more lucrative posts in Europe and North America anyway), but how to provide primary health care to the rural areas — and thus to the majority of the people. Perhaps the best known of such efforts is the Chinese example of “barefoot doctors,” but the concept of auxiliary health workers with specialized training is by no means limited to China. Under various names and in different forms it has been and is being tried in many parts of the world — often with dramatic results.

The IDRC is supporting a number of such projects at different stages in their development. Here Alexander Dorozynski, Associate Director, Publications, examines one success story from the Middle East.

About 60 percent of Iran's 33 million people live in some 65,000 villages. Outside of the major cities and towns there is one doctor for every 15,000 people. The infant mortality rate in rural Iran is over 120 per 1000 live births. These are the statistics that led to the creation in September 1973 of Iran's experimental Village Health Worker program.

“There is no alternative,” says Dr Houssain Ronaghy, Director of the Department of Community Medicine of Pahlavi University and initiator of the project. “Even in the next 20 years we cannot possibly supply every one of these villages with a physician. In this country, and in most developing countries, the priorities are in primary health work rather than in creating fancy hospitals which consume most of the money.”

To prove his point, Dr Ronaghy set out to create a model for village health care that would provide at least a “partial solution” to the problem. Now a study of the first years of operation of the Village Health Worker (VHW) program vindicates the doctor's stand and shows that a health auxiliary stationed in a rural area can make a considerable contribution to the general health of the local population.

The idea was simple, and, Dr Ronaghy admits, not unlike the Chinese model. In an area near the town of Kavar, south of Shiraz, where the university is based, 16 isolated villages were selected, and from each one volunteer was chosen — a literate villager who would have no trouble reintegrating into village life once he or she had completed a six-month

training course. The course consisted of classroom sessions, demonstrations and clinical training with Health Corps physicians — young MDs who serve for 18 months in the rural areas in lieu of military service.

Aged between 16 and 45, the trainees studied the diagnosis and treatment of the more common diseases, health education, environmental sanitation, nutrition, family planning and disease prevention. All 16 completed the pilot course (although one quit, then returned a month later, more enthusiastic than ever after a short spell of life in the city) and returned to their villages as paid health auxiliaries. They continue to take "refresher" courses, and receive regular visits from a university doctor who reviews difficult cases with them and offers advice and guidance.

From the beginning evaluation was considered an essential component of the project, both to assess the impact of the VHWS work and to assess the project's potential for use on a nationwide scale. Fifteen months after the VHWS began work, Dr Ronaghy's team went into the villages to find out how the program was working.

The study was carried out by a physician, Dr Bahram Zeighami, assisted by his wife Elaine, a statistician, and covered a number of points. First, had the VHWS been accepted by the villagers? Second, what was their impact on family planning, especially on use of the contraceptive pill? Third, the study sought to determine their influence on birth and mortality rates.

To ensure a valid base for comparison, 16 control villages were chosen in the same region. These were similar to the project villages in every way, except that they did not have a resident health auxiliary.

The first finding was that the villagers' reaction to the VHWS was very positive: 220 out of 226 respondents said they were happy with the auxiliaries' work. While most expressed more confidence in the older workers, there was no marked preference for men or women in the VHW role — an important point in a country where traditionally men are dominant.

With regard to family planning, the study showed that the project villagers were better informed about contraceptive methods, and that the use of such methods was more widespread than in the control villages. This was reflected in a lower birth rate (by about 10 percent) in the project villages, despite the fact that the study was carried out only 15 months after the auxiliaries began work — in other words, only six months after they could have begun to have any influence on the birth rate.



Preventive health care begins with clean drinking water: health worker checks village well.



Photos: Neill McKee

The study found that women were as acceptable as men in the village health worker role.

The second stage of the study produced the most striking results, however. This involved a census of the entire population of the two groups of villages, in order to obtain the most complete statistics possible on birth and mortality rates.

The impact on infant mortality was particularly significant: the rate was 64.3 per 1000 live births in the project villages, against 127.7 in the control villages. In other words, the VHWS have almost cut the infant mortality rate in half. It is worth noting that the figure of 127.7 per 1000 for the control villages is close to the WHO figure of 120 per 1000 for Iran as a whole. The crude death rate also exhibited a considerable drop: 10.2 per 1000 in the project villages, compared to 17.5 in the control villages.

Two other studies are under way in the Kavar region. The first will cover 1000 cases treated by the VHWS, and in each case their diagnoses and treatment decisions will be compared with those of a physician. An earlier preliminary study seems to indicate that the efficiency of the VHWS in the diagnosis and treatment of common diseases is very close to that achieved by a physician. In serious cases or those that are beyond their capabilities, they must refer the patient to the nearest health centre.

Finally, an attempt is to be made also to gauge the effectiveness of the VHW as a health educator, by comparing the health knowledge of the people in the project villages with those in the control villages.

The success of the Kavar pilot project has led to the recruitment of a second group of VHWS and helped in the launching of another project that has received the support of Iranian health authorities. Its purpose is to train "middle-level" health workers, known as behdars. They will receive four years training before being stationed in large villages or small towns, where they will supervise and assist the VHWS, and serve as a link between the village and the physicians or the hospitals.

A school has been opened in Marvdasht, a small town 45 km from Shiraz, and special printed and audio-visual teaching materials have been developed by Pahlavi University. Students receive a total of 4768 hours of training, of which one-quarter is theoretical and the remainder is practical work, under supervision, in clinics and the villages. The best graduating students will be chosen to take intensive courses in teaching techniques, so that they in turn will be able to train VHWS. Eventually they may replace physicians in the rural areas altogether.

As Dr Ronaghy points out, these are rural people: they understand the culture and the dialects. "I feel strongly," he adds, "that our physicians are trained in Western methods, and this training is simply not suited to the situation in rural Iran."

It was Monday morning routine in the corrals at Muguga, a half-hour's drive out of Nairobi. Three Kenyan assistants were restraining a Holstein calf on the ground. A research worker knelt and hammered a small needle into its sternum to extract a bone marrow sample. The calf was released to a larger corral, looking healthy enough to the unpractised eye. But it was likely to die within a few weeks, victim of East Coast Fever. About 500,000 calves die each year in East Africa from this tick-borne disease.

That Holstein calf, and others among the 1400 head of cattle kept at the Muguga station of the East African Veterinary Research Organization (EAVRO), have been playing a central role in the drive to develop control measures that will be effective against the scourges theileriosis (of which East Coast Fever is the deadliest type) and trypanosomiasis.

Earlier efforts to check these diseases in Africa concentrated on methods to control the vectors — the tsetse fly that carries the trypanosomes after a bloodmeal from infected cattle or game animals, and the tick that falls engorged off an infected cow or buffalo and is picked up by susceptible grazing cattle. But control measures, whether they involved clearing the bush or dipping the cattle or even exterminating the wild game that were hosts to the parasites, have not solved the problem.

A number of governments and agencies are supporting this cooperative effort in Kenya with scientific and technical assistance and funds — the East African Community, FAO, Britain's Overseas Development Ministry, USAID and the Pfizer Co. The IDRC contribution amounted to \$500,000 in the first phase that began in 1973, and is being increased to \$900,000 in a second phase. About 23 percent of these funds have gone to the University of Guelph, Canada, in support of research on trypanosomiasis.

The IDRC-sponsored effort is centred upon learning much more about the host-parasite relationship, particularly the distribution of trypanosomes in the body system of cattle, how the deterioration of injured tissues progresses, and what immunological responses the parasite evokes. The bone marrow sample from the Holstein calf helps the EAVRO staff monitor the response of the blood-forming tissues to infections.

Results in the first phase were seen as significant by a group of 40 scientists who attended a review meeting in Nairobi last year. One important finding at the Muguga laboratories is the range of differences in the infections caused by two species of trypanosomes, *T. vivax* that dominates in West Africa and *T. congolense* that is the scourge in East Africa. Previously African trypanosomiasis had been regarded as a single disease entity.

Work done at Guelph suggests that the anemia resulting from *T. congolense* is caused by immunological mechanisms — in other words, that it is a reaction from the antibodies, rather than from the infection directly, that injures the red blood cells.

There are daunting difficulties, too, in the control of *theileria*, as there appear to be many different strains. At Muguga, the FAO and Pfizer groups have been mixing "cocktails" of half-a-dozen strains in an attempt to protect the cattle from as many of these different organisms as possible. It is at this stage something of a hit-or-miss approach, but for the first time a large mass of data is being gathered on the parasites themselves and the diseases they cause.

The departure from EAVRO in the late 1960s of many expatriate scientists meant that Muguga suffered from a lack of experienced staff. As a result, the leadership in the first phase has been in the hands of Canadian, British and American scientists. During the second phase the training program is being stepped up, so that by its close five African scientists should have gained their Ph.Ds. □

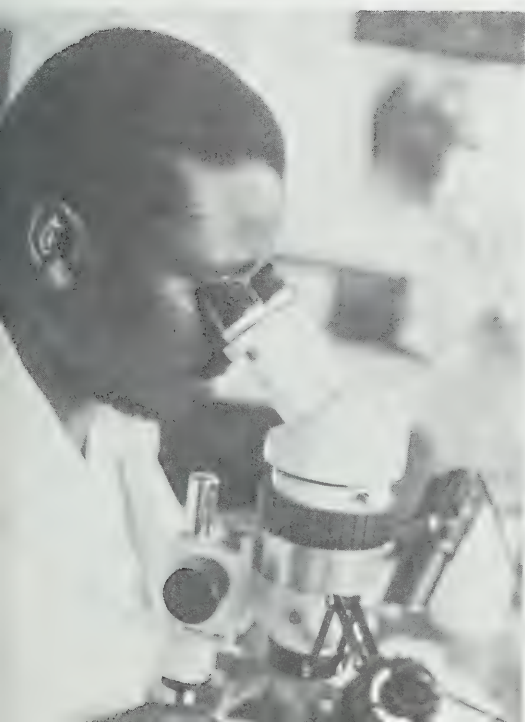
Combined effort combats African cattle killers



The killers: the ticks that carry East Coast Fever are picked up by grazing cattle (above), and the tsetse fly, carrier of trypanosomiasis (above right).



*Left: Monday morning routine at the corral.
Below: game animals like this eland often
carry ticks that infect the cattle.*



*Above: dipping the cattle has not solved the problem. Left:
researcher Peter Omoya studies ticks at the EAVRO laboratory.*

The United Nations Habitat conference held in Vancouver in June, 1976, has been called a failure or a success, depending on who made the assessment. Those who believe that the millions spent on the conference were wasted have asked, like Peter Wilsher of the *London Sunday Times*, "Will hot air ever house the poor?" Critics cited the Arab-Israeli conflict, the lack of agreement on a declaration of principles, and the failure to raise funds to cope with human settlements problems as proof of failure. Even the question of what to do with the films, slides and audio-visual material that made Habitat so different from other UN gatherings was not clearly answered.

A proper assessment of Habitat, however, should not focus on the two weeks in Vancouver. The fact is that for the past two years or so, preparations for Habitat have been going on in practically all countries in the world. Within that time, the issues related to human settlements have been studied, discussed, analyzed, and, in some instances, incorporated in development policies and programs. This process has helped to make policymakers and administrators more sensitive to the problems of human settlements. It has also made possible the identification and assessment of practical solutions to the problems related to human settlements.

The true test, then, is for the future. Can those same Third World policymakers and administrators, acting on their heightened sensitivity, achieve some of those practical solutions? In the words of British economist Barbara Ward: "The developing world has a marvellous chance not to repeat our ghastly errors, not to louse it up." The success or failure of Habitat will ultimately be judged on whether or not the rich and poor countries can pull together to avoid "lousing it up."

Building on a shaky foundation

It is not known how many tons of paper, films and other materials Habitat produced, but at Vancouver, and in the couple of years preparing for the conference, it must have been considerable. All that mass of materials, however, is a shaky foundation for a structure that is needed to continue the work commenced at Vancouver.

Cynical observers of large United Nations conferences usually predict that they inevitably result in proposals to create yet another international organization to implement the recommendations of the conference. Habitat was no exception, in that there is already in existence the skeleton of a Habitat and Human Settlements Foundation, organized under the UN Environment Programme (UNEP). Vancouver did not resolve the issue of what structure to create for human settlements. This is crucial because much of what happens after will depend on how this issue is resolved.

Two basically similar proposals came up for consideration during debates on a program for international cooperation. The main difference between them is where the new organization should be: under UNEP or under ECOSOC, the UN Economic and Social Council. Vancouver was too politically charged and confused to deal with this choice of institutions effectively. There were those who thought that this matter would be better handled in the carpeted halls of the UN Secretariat building, anyway.

Related to the question of institutional choice was the geographical location of the new agency. UNEP advocates, of course, preferred Nairobi while ECOSOC supporters lobbied for New York. There was also an invitation to set up the office in Mexico. It is one of the minor tragedies in Vancouver that because of the bureaucratic pressure groups at play, the most important question of an institutional base for continued work on human settlements could not be clearly resolved.

Another question gingerly skirted by most countries in Vancouver was who would foot the bill for the operations of the program so hotly contested by two UN agencies? The developed countries, which traditionally provide the bulk of UN financing were silent on the funding issue. The Third World countries, who were most articulate in defining the magnitude of the problem of human settlements, were reticent about financial commitments. The Habitat and Human Settlements Foundation did get some pledges. However, the amounts mentioned did not even hint at the \$3 billion a year over the next 10 years, estimated necessary to "bring the majority of mankind to the level of minimum human needs."

People, bread and water

While there was very little agreement at Habitat on particular measures, there was general acceptance of the view that nation-building requires the involvement of all people, including those living in small settlements and out-of-

the-way places. Based on the experiences of developed countries, the dangers arising from big government and other super-scale institutions were realized. Thus, the need for more distributive programs which, in most instances, require subsidies from the richer to poorer human settlements was recognized. Again, the particular means for achieving this (taxation, grants-in-aid) varied enormously. The important thing, however, is the realization that true development requires the involvement of most, if not all, members of society rather than just the participation of a privileged few.

For too long development planning has been characterized by a sectoral approach that concentrated on industrialization, agricultural production, manufacturing, import-substitution and growth. Many planners did not consider the spatial aspects of development. Failure to take a spatial viewpoint meant, in many instances, favoring particular regions at the expense of others. In many countries, sectoral planning tended to concentrate development in large cities and central metropolitan areas, leading to a vicious cycle of making them very attractive to migrants, who abandon the countryside for the already bloated cities.

Introducing the spatial element in development planning is based on the realization that while growth is desirable, the more equitable distribution of the fruits of production among people in space and along socio-economic lines, is equally important. Thus, development strategies based on a perspective of human settlements plan-

HABITAT

and of the beginning?

A. A. Laquian



ning are necessary to bring in the "social justice" component in such strategies. Left to itself, the *laissez faire* development process usually leads to over-concentration of socio-economic activities in large metropolitan areas. Power begets power, the economically influential also tend to be the politically powerful, and they tend to be people who live in national capitals. To counteract these tendencies, more conscious plans for the development of other human settlements are needed. This linking of economic growth with socio-economic justice was the main message in Habitat. Based on the documents, films and slide shows presented, and the themes discussed at the conference, it is clear that the message was accurately received in many developing countries.

Many views at Habitat called for planning on a human scale. This means such measures as decentralization of government programs, the planning of communities and edifices more modest in scale, and the redesign of the environment so that it does not brutalize human beings by making them too aware of their smallness. An anti-highrise buildings sentiment was most marked among the participants, building technologies favouring self-help and use of local materials were applauded. The cliché of popular participation, long a stand-by of practically all UN documents, was given the benefit of specific forms and procedures as

countries explained what programs and projects they have tried to improve human settlements. The questions of rich and poor — ranging all the way from the level of the slum areas versus wealthy suburbs to the proposal for a social benefits transfer from rich to poor nations — were all explored.

Nowhere were the discussions of sharing and distribution more pronounced than in Habitat Forum, the parallel meeting of non-governmental associations held at a reconstructed former seaplane base on Jericho Bay, five miles from the formal conference site (see box). There, "moral" leaders as varied as Mother Teresa of Calcutta and Barbara Ward, spoke of the need for bread and water for the world's poor. When Canada's Prime Minister Trudeau said that human settlements problems can be solved only by "passionate love," Mother Teresa countered that a better solution would be for him to eat less and share his resources with others. Barbara Ward asked that a fraction of what the world spends for arms be spent for "pure, sweet water." She estimated that about \$3 billion a year for the next decade would provide water to all human settlements in the world.

More than a thousand words

Believing that, if a picture is worth a thousand words, moving pictures should be worth much much more, the organizers of Habitat mounted a multi-media communication system that made the Vancouver conference-exposition a unique experience. In addition to the documents, exhibits, films, slides and other modes of communication, Habitat also used television to its fullest capabilities. From four hotels, three committee rooms and Vancouver's largest theatre, all the highlights of what was happening were available to everyone through closed-circuit television. The conference became a self-contained communications network, where issues and personalities were constantly aired and exposed, allowing for fuller deliberations.

The multi-media presentation resulted in something like 10,000 films, slides, videotape cassettes and other audio-visual materials that constitute a veritable gold mine of information. One of the thorny issues in Vancouver was the further use of these materials. The University of British Columbia offered to set up a centre for their storage, retrieval and further use. The amount of

\$5 million was mentioned as available for this facility.

Andreas Fugelsang, the UN expert who coordinated the audio-visual efforts, thinks it would be a waste to treat the materials mainly as a library resource, to be catalogued and filed like so many bits of information to be retrieved only when somebody asks for them. He feels that there is enough material from Habitat that can be reworked to make up educational and entertainment materials. He also strongly believes that an audio-visual centre should continue to produce films and other materials to keep up with human settlements development. Vancouver is only a beginning, and although it focused the world's attention on human settlements issues, there is still a big need to continue deliberations on practical ways and means of solving human settlements problems. To do this, the audio-visual centre should be an activity base, not a passive repository of used materials, says Fugelsang.

What happens now?

Those who believe the Vancouver conference failed had expected the participants to rise above ideology, nationalism, and narrow partisanship to discuss the important issues of human settlements. Clearly, this was too high an expectation. Neither was it a realistic one, considering the fact that anything coming out of the human settlements debates must inevitably be the result of political as well as other considerations.

What happens after Habitat, however, cannot be properly assessed from the presence or absence of agreement on such issues as whether or not another UN agency should be set up, where it would be located, and how it would be funded. In the final analysis, what happens after Habitat should be assessed at the country and even local community level. For it is in slum and squatter communities where housing and other human needs are greatest, in small farming communities being denuded of their best people who move to cities, and in the small towns and cities continuing to stagnate because of governmental neglect, that the impact of Habitat has to be felt.

That impact would be most keenly felt in the community of Tondo, in Manila, Philippines, for example. As part of the Habitat program, the International Architectural Foundation sponsored a competition where some 2,500 of the world's architects agreed to prepare an integrated plan for a community of three to five thousand squatters and slum dwellers, design a house that would cost no more than \$300, and provide institutional arrangements for self-help housing. The IDRC, as one of the patrons of the competition made possible the participation of the local people of Tondo during the judging, providing support for the leader of the community associations to go to Van-

couver and assist the jury in its deliberations. The results of the competition were presented at the Vancouver Art Gallery, the issues involved in the competition were debated in the Habitat Forum, and the winning architect, Ian Athfield of New Zealand explained and defended his main concepts. The discussions were made more dramatic by anti-martial law demonstrations when Mrs Imelda Marcos, First Lady of the Philippines and Governor of Metropolitan Manila, came to address the conference. Issues ranging all the way from peoples' participation in community planning to the moral responsibility of architects in responding to their clients wishes were hotly debated.

After Vancouver, however, the fact still remains that Tondo is the largest slum-squatter area in the Philippines, that with 100,000 people living under conditions of poverty and lack of services the community demands actual solutions to its problems, and that even with assistance from the World Bank, considerable national and popular resources are needed. The Habitat conference in Vancouver served to highlight the issues, clarified the lines of debates, identified the protagonists, and raised the consciousness of those who participated in the debates. When all is said and done, however, the impact of all this on the lives of the average Tondo resident is difficult to measure.

As it is in Tondo, so it is with other poor communities all over the world. What happens after Habitat is basically what happens to people in cities, towns and villages anywhere. □

A. A. Laquian, Associate Director of the Centre's Social Sciences and Human Resources Division, was a member of the international coordinating committee for Habitat Forum.



Apartment living Hong Kong style: the strength of feeling was against high-rise buildings.

Half-completed version of Ian Athfield prizewinning self-help house, and, far right, part of the community of Tondo, Manila, the Philippine

Old friends at

the Forum

Clyde Sanger, associate director of the IDRC's Publications Division, gives his impressions of the happenings at the Habitat Forum.

What part did the IDRC, or rather the people connected with the Centre, play at Habitat? There was no huge banner or totem pole under which they gathered in serried ranks, as did some other groups. Nor did the IDRC set up a booth in Hangar 8 alongside the scores of organizations (from the Appropriate Technology Group to the International Planned Parenthood Foundation) that enlivened that huge building.

Yet the IDRC, which supports many research projects relating to the problems of human settlements, was well represented. To attend the news conference with which the Vancouver Symposium launched its opening Declaration on the first Sunday, was to be among old friends and campaigners. Former IDRC governors Barbara Ward and Maurice Strong were fielding most of the questions, and Dr Soedjatmoko, a member of the present Board, was sitting encouragingly beside them.

The Symposium, also known as the Group of 24 or "Barbara Ward's Circus," worked hard throughout the conference to get the fullest possible discussion of the fairly controversial views they had embodied in their Declaration. They lobbied delegations, they made major speeches at the Forum, they spent a full day halfway through to review and enlarge their

statement. They lost some of their battles at least for the time being (the moratorium on nuclear power generation) and they won others (unearned increment on land values). They fought them all spiritedly.

There were friends, too, among the heads of delegations. The Nepalese delegation, for example, was led by Dr Ratna S. B. Rana, who was coordinator of an IDRC-supported regional development study, and is now a member of his country's National Planning Commission.

One afternoon at the Forum there was a workshop session on low-cost housing addressed by five speakers who have been working on the collaborative studies in Asia and Latin America that have also received IDRC funds. The room was crowded, and there was too little time to discuss all the issues raised. But each speaker provided plenty of copies of his paper, so that the ideas are now well distributed around the world.

On another occasion, in the biggest forum of all (the plenary stage of Hangar 5) two other men who have directed IDRC-supported projects gave papers on rural development. Chandra Soysa, of the Marga Institute, argued that placing more emphasis on rural housing had excellent spin-off in terms of jobs that would fill the "slack season" on the farm and develop non-agricultural skills such as carpentry and masonry, useful in diversifying rural activities and increasing incomes. Vinyu Vichit-Vadakan, of the UN Asian Development Institute, was candid about some of the past mistakes made in resettling hill tribes and also people affected by dam construction in Thailand.

At a conference where the strength of feeling was against high-rise buildings, Yue-man Yeung, of IDRC's Asian Regional Office, took a brave stand in a workshop on the role of tall buildings in

human settlements. In a paper called "High-rise, high-density housing: myths and reality," he challenged the criticisms that high-rise living runs counter to neighbourliness and has other adverse social and psychological effects. They will be proud of him in Singapore.

Prod Laquian was, of course, everywhere during an exhausting week: organizing the low-cost housing workshop, mediating in the dust-up over the Tondo resettlement contest in his native Philippines, making a speech to introduce Margaret Mead at a big lunchtime meeting, fielding questions at a news conference, huddling with his Symposium colleagues.

Finally, Jorge Hardoy of Argentina, who will be an IDRC Research Fellow in coming months, gave a hard-hitting address on "The Habitation of the Poor." A particular target was land speculation in Latin America.

A brilliant talkfest? Undoubtedly — but what about the action? As Prod Laquian says in his article above, Habitat-at-Vancouver has to be seen in the continuum of the work done in preparation and the work that is to come.

At IDRC the Population and Health Sciences division is now organized to lend its support to a range of projects in the sectors of rural water supplies and sanitation; two recent workshops in Nairobi and Maseru explored the priorities as African scientists saw them. In the Social Sciences many projects in the broad field of human settlements are already under way, whether in migration or low-cost housing or regional development. Nothing happened at Vancouver to lessen these concerns.

Despite the frenetic pace of the Forum (a dozen interesting events happening almost simultaneously) it was a place where many workers were able to recharge their batteries to the full. □



Development must start at the grass-roots level



Nihal Kappagoda, formerly Director of the IDRC's Asia Regional Office in Singapore, recently joined the Centre's Ottawa headquarters as Vice-President, International. The following article is based on a presentation he gave at a seminar on development communications organized by the Asian Mass Media Information and Research Centre.

Many of us who were versed in traditional western theories of economics believed that an increase in economic growth at the desired rate would achieve all the development a country needs and that the results of this growth would be widely distributed.

Using acceptable rates of economic growth, we derived investment targets based on historical capital output ratios adjusted for known changes. From that, we went on to examine the investment possibilities in the different sectors and came up with projects necessary to fill these investment targets, in other words, to put meat to the framework that we had set up. Once we got a package of projects that could adequately meet these investment targets, we next determined what financial resources, both domestic and foreign, were required to finance these

investment targets. From there, we went on to estimate what tax revenues were required to meet the target for domestic resources and in the case of foreign exchange, policies and programs were designed to generate additional foreign exchange earnings through exports or an attempt was made to fill the gap in foreign exchange through enhanced levels of foreign assistance.

This is a rather simplified way of describing the process, which unfortunately led to a concentration of our energies in filling the "gap", either of domestic resources or foreign exchange resources. We approached donor agencies with an overall gap without going into the details of the makeup of the gap or the full impact of the various investments that were being planned. An alternative approach was not considered as we were planning to increase the overall rate of economic growth, in the expectation that these increases would seep down to the grass-roots level. This was the thinking in the 1950s and it led to the targets that were laid down by the United Nations for the first Development Decade in the 1960s, when it was stated that an acceptable rate of growth for developing countries would on the average be around five percent. As events turned out, many developing countries exceeded this growth rate, but in spite of this, at the end of the decade many of the basic problems remain unsolved.

For instance, malnutrition was prevalent. Estimates at the end of 1970 showed that at least one-third to one-half of the world's people suffered from hunger or nutritional deficiencies. Infant mortality remained high. Infant deaths per thousand live births were four times higher in developing countries than in the developed countries. Life expectancy remained low. A man in the west could expect to live about 40 percent longer than an average man in a developing country and certainly twice as long as a man in Africa. Illiteracy remained widespread. There were 100 million more illiterates at the end of 1970 than there were 20 years ago, bringing the total to something like 800 million. More important, we found that unemployment was endemic and growing. On the average 20 percent of the male labour force remained unemployed and the population in urban areas was growing at least twice as fast as the number of jobs. Further, the distribution of income was severely skewed. From statistics available for 40 developing countries, it was found that on the average, the upper 20 percent of income earners received 55 percent of the national income, the upper 40 percent received 75 percent, while the lowest 20 percent received only 5 percent.

These problems all remained after a decade of economic growth of over five percent achieved by many of the developing countries.

It was really at this stage that people began to talk of social justice and the quality of life, and began looking at social indicators like malnutrition, infant mortality rates, life expectancy, illiteracy, unemployment level, distribution of income, number of physicians per thousand head of population and so on. There began a shift in the planning process towards a consideration of these social factors.

Before we adopt redistribution as a primary objective of planning, however, I would like to introduce a note of caution: we should not go completely to the other extreme. In doing so, I would like to quote an example from Sri Lanka, where the government adopted liberal social welfare policies at the end of the Second World War. Extensive free health care services, free education from the primary level to university, subsidized public transportation and the issue of subsidized food formed part of the package of welfare measures. As a result of these policies Sri Lanka was able to reduce inequalities in income.

To illustrate the improvements, in 1953 the top 10 percent income group received 42.5 percent of total national income. Twenty years later this was reduced to 29 percent, while the lowest 10 percent increased their share of total income from 1.5 percent to 4.7 percent. However, these welfare policies were really carried out in a period of slow growth and were financed by sacrificing development expenditures. Sri Lanka was rather fortunate that in the immediate post-war years, the export sector was very buoyant, which enabled the government to siphon off tax revenues to finance welfare measures. In the same way, foreign exchange was available to finance imports too. These measures of redistribution were implemented in a period of sluggish growth and it finally led to a social upheaval of the type we had in 1971.

Therefore when we look at the two patterns, one which concentrates merely on economic growth and the other on redistribution through welfare policies, it is seen that both are inadequate. Thus we should adopt policies that would enable the two objectives to complement each other — policies that would achieve redistribution against a background of a satisfactory rate of economic growth.

How do we map out a suitable strategy? In many countries of Asia, one should look at the agricultural sector and plan to achieve the maximum growth in output from this sector. Seventy percent of the people in developing countries live in rural areas and in many countries of Asia 30-40 percent or more of gross domestic product is contributed by the agricultural sector. For the foreseeable future, this sector will provide avenues of employment to the large number of young people reaching the labour market.

In planning for the agricultural sector, one is faced immediately with many problems. For instance, farm holdings are fragmented and a few people own large areas of land. Tenancy agreements are enforced that make it necessary for farmers to hand over more than half of their crop to absentee landlords. In this type of situation, unless we introduce land reforms, any type of planning to increase the growth of the agricultural sector, will not benefit the poor farmers. Although high-yielding varieties have been introduced, farmers are often unable to obtain adequate credit or other inputs that are required to maximize the benefits from these varieties. Unsatisfactory foreign exchange rates sometimes make it more attractive for the large-scale farmer to import machinery than get the same work done by employing rural people. There is a whole range of policies which have to be implemented to maximize the potential output in the agricultural sector.

Many countries in Asia have realized the value of concentrating on the agricultural sector, particularly through the integrated approach to rural development that is much talked about these days. Attempts are being made to mobilize the support of the people at the grass-roots level for the entire planning process. For instance, an example from Sri Lanka once again, where the government set up Divisional Development Councils in the rural

areas to mobilize resources that are available within each area to increase production of food and other items. It is in this area that I feel the mass media could make a contribution in mobilizing the popular participation of the people.

In the earlier stages, where we concentrated on economic growth, the people benefitted from the results of this growth indirectly, and in some cases may not even have been aware of the benefits. Looking at it from the other end, we are now trying to build up the planning process from the grass-roots level, starting from the villages, on to the districts and then leading up to the centre. To achieve the objective of employment creation, one needs to get the involvement of the people in setting this process in motion.

It is true that the rates of economic growth one would achieve through this approach may not be as great as those that would have been achieved by massive investments, based on the traditional theories of growth. Nevertheless, one has to look at the well-being of the rural people, after all it is their welfare by and large we are trying to improve, as they make up over 70 percent of the population in our countries. I feel that by making the people aware of development problems and the need for them to participate in the development process, the mass media has a constructive role to play in accelerating the process. □



Agriculture must remain a priority for developing countries, where 70 percent of the people live in rural areas.

BRIEFS

ENERGY 1 — RURAL CENTRES SEEK THE RIGHT MIX

The worldwide energy crisis, while it may have resulted in many serious problems, is also having at least one beneficial side-effect: it is forcing the world's scientists to search for alternatives to non-renewable fossil fuels as a source of energy.

One effort worthy of note is the establishment of two "rural energy centres" — one in Senegal, the other in Sri Lanka — which will demonstrate the practical possibilities of providing the energy needs of a village of 1000 people with an "energy-mix" of solar power, wind power and bio-gas. The two feasibility studies are being carried out by the Brace Research Institute of Canada and the Engineering Department of Oklahoma University, USA, and are supported by the UN Environment Program.

The object of the energy-mix concept is to overcome the problems resulting from the fact that neither the sun nor the wind can provide continuous supplies of energy. Bio-gas, based largely on the successful Indian process of using animal dung, is the most reliable power source for cooking and lighting.

If successful, the action-oriented project will likely be taken up and extended by the governments concerned, says UNEP's executive director, Mr Mostafa K. Tolba. The most important aspect of such planned energy centres, he adds, would be their use of non-polluting, renewable sources of energy, together with their economic and social acceptability to the villagers.

ENERGY 2 — TAKING NITROGEN FROM THE AIR

The energy crisis is also a fertilizer crisis. As fossil hydrocarbon supplies dwindle, so the cost of petroleum-based nitrate fertilizers increases.

Yet nitrogen is abundant in nature: close to 80 percent of the air we breathe is made up of nitrogen. Could not this free nitrogen be used to supply plant growth?

The problem to date has been that neither plants nor animals can directly use atmospheric nitrogen, it must first be converted into

nitrites by soil micro-organisms. Only legumes such as beans and alfalfa have been able to use free nitrogen through the action of the rhizobia bacteria, which, penetrating into their roots, form nodules where they fix nitrogen in a form usable to plants.

Researchers in a number of centres, particularly in Britain and Brazil, have now identified dozens of nitrogen-fixing bacteria, and laboratory trials to introduce them to cereal crops have yielded promising results. A bacteria, *Spirillum lipoferum*, has been coupled successfully with crops such as wheat, corn and rice. Given certain conditions — the right soil type and high temperatures — this coupling can also be achieved in the field.

While wide-scale utilization of nitrogen-fixing bacteria is not expected in the near future, the first results are promising. If research now underway succeeds in creating new stocks adapted to particular crops, tropical agriculture can look forward to cheap and abundant fertilizer supplies in the foreseeable future.

ENERGY 3 — MAKING THE FERTILIZER GO FARTHER

Hardest hit by the current scarcity and high cost of chemical fertilizers are the densely populated and land-scarce nations of Asia. About one-quarter of Asia's staple rice crop is now planted to high-yielding semi-dwarf varieties that were developed at least partially in response to the availability of cheap chemical fertilizers and pesticides.

The millions of small-scale farmers who have reaped the benefits of the new rice technology simply don't have the capital to compete with large-scale western farmers for scarce agricultural chemicals.

Scientists at the International Rice Research Institute (IRRI) in the Philippines have come up with at least a partial solution to the problem: make the fertilizer go farther by using it more efficiently. They have found, for instance, that fertilizer applied in homemade "mudballs" produces almost double the yield of a conventional application.

The technique, generally known as root-zone placement, is even more efficient when used to distribute pesticides. It does, however, have its drawbacks, the major one being the high cost of labour required to produce the

"mudballs" on a sufficiently large scale. IRRI engineers are now working with entomologists and agronomists to develop and test inexpensive manually operated farm implements to streamline placement of chemicals in the paddy mud — they have even tested a modified grease-gun with promising results.

For the longer term, the scientists are considering other chemical-reducing technology, such as the development of varieties that make more efficient use of fertilizers, and biological control of rice pests.

BREAKTHROUGH ON THE MALARIA FRONT

An important development in the battle against malaria has been announced by Professor William Trager of New York's Rockefeller University: the continuous culture in vitro of *Plasmodium falciparum*. Particularly widespread in Africa, *P. falciparum* is responsible for the most serious kinds of malaria, and in some parts of Asia it has become resistant to the major antimalarial agents.

This important breakthrough comes as the Special Program of Research against Tropical Diseases, sponsored jointly by the World Health Organization and the UN Development Program, is endeavouring to ensure its financing (to which the IDRC made an initial contribution). Under this program, Professor Trager is a member of a working group on the immunology of malaria; the group's goal is the development of a malaria vaccine.

The malaria situation is serious: according to the WHO, reported cases in India exceeded 4 million in 1975, against 60,000 in 1962. Dr Adetokumbo O. Lucas, Director of the Special Program, states that in Africa, the disease is so deeply entrenched in the environment that neither the spraying of insecticides nor the distribution of medicines suffices to prevent its transmission.

PLEASE DON'T EAT THE PAPER...

Bagasse, the dry fibre that is left over after sugar cane has been processed, has until recently been regarded largely as a nuisance by sugar producers who must dispose of vast quantities of the stuff every year. In fact it may prove to be a valuable resource.

The IDRC is currently supporting a project in Mexico to convert bagasse into cattle feed (see IDRC

Reports Vol. 4 No. 3). In Cuba, which is one of the world's major sugar producers, the UN Development Program and the Industrial Development Organization are supporting Cuban researchers in their efforts to produce newsprint and paper pulp from bagasse at a reasonable cost.

The Cuban project began in 1974, and a design for a pilot plant was recently approved. Construction of the plant is already underway, and if the process proves viable, it could go a long way towards solving the problem of what to do with an estimated 7 million tons of bagasse each year.

With a worldwide shortage of newsprint predicted by the end of the decade, such a process would also save Cuba and other sugar-producing third world countries valuable foreign exchange, in addition to creating employment in a new industry and providing the paper products needed to educate millions of people.

'STRETCHING THE EARTH' NEW IDRC FILM

Stretching the Earth, a 16-mm film illustrating some of the work that the Centre is supporting in the Third World, has been completed and had its first official showing during the Board of Governors' meeting in September.

It takes as its theme the question of whether population growth will outstrip food production in the next quarter-century, and produces arguments (through the projects illustrated) for the hope that these problems will be solved through the application of science and technology. It puts emphasis on the Centre's support of training programs, to help people in the Third World develop their own capacities and "make the best use of all the means available to tackle the problems that face their countries and the world" — hence the film's title.

This 22-minute documentary is the first film to result from visits to 26 countries over the past year by Neill McKee, head of the Centre's audio-visual unit. It ranges from some rolling scenes aboard a shrimp trawler off Guyana to the sight of great herds of cattle clustering around watering points in northern Senegal. Sound effects — a Malian wedding dance, an Egyptian farmer urging on his ploughing team — were gathered on the spot. The script was written by Clyde Sanger, and narrated by Paul Harris.

A French-language version was being completed during September, and a separate film, in Spanish and concentrating on work supported in Latin American and the Caribbean, was also nearing completion. Any of these films will be available on loan from IDRC Audio-Visual Section in Ottawa, or through the regional offices.

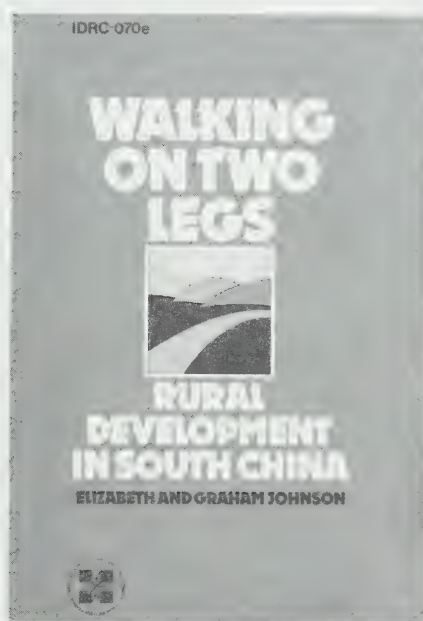
New publications

Food Production in India — A Perspective, by W. David Hopper. Published July 1976, 30 pages, IDRC-066e.

Originally published as the sixth annual Coromandel Lecture, this is, in Dr Hopper's words: "A personal perspective that centres on issues fundamental to the agricultural progress of this great nation." Dr Hopper, who lived and worked in India for a number of years, traces the progress of post-independence agricultural development, and points to some lessons for the future that can be learned from the experience.

Low-cost Rural Health Care and Health Manpower Training — An annotated bibliography with special emphasis on developing countries, Volume 2, by Frances M. Delaney. Published August 1976, 182 pages, IDRC-069e.

This is the second in a series of bibliographies that attempts to coordinate information, both published and unpublished, on nontraditional health care delivery systems. The focus in this volume is primarily on new models of health care delivery and the training and utilization of health workers. Contains 700 references, separately indexed by subject, by author or institution, and by geographical location.



Walking on Two Legs, by Elizabeth and Graham Johnson. Published July 1976, 72 pages, IDRC-070e.

This is an account of an investigation into the operation of rural communes in South China made by an anthropologist and a sociologist from British Columbia with the assistance of an IDRC research grant. It is, in the words of the authors "A compilation of facts about, and an interpretation of, the Chinese model of rural development" that should be of special interest to development workers in Third World countries who are concerned with the well-being of rural peoples.

Interface — IDRC Review 1975/76, by Bob Stanley. Published August 1976, 32 pages, IDRC-073e.

A non-technical review of the work of the IDRC over the past year, that illustrates the overlapping nature of the Centre's major areas of concern — food, health, technology, information and social sciences. Includes an introduction by IDRC President, W. David Hopper, first-hand reports on current projects, and a list of new IDRC publications.

Interface

IDRC Review 1975-76



世界
發展

Maiduguri Mill Project — Grain milling and utilization in West Africa. Published June 1976, 16 pages, IDRC-TS2.

This is a report in the IDRC's technical studies series on a pilot project in rural Nigeria. The project employs a systems approach to the postharvest handling of food grains, from operation and management of a pilot flour mill, to quality control, new product development and testing, marketing and the establishment of a bakery.

Optical Character Recognition — Use of OCR techniques in decentralized data collection for bibliographic information systems, by H. W. Groenewegen and J. Marshall, International Atomic Energy Agency, Vienna. Published July 1976, 96 pages, IDRC-TS3.

Today's international information systems are dependent on modern computer techniques, a fact that presents problems for those developing countries that do not have the facilities to produce material in computer-readable form. In this technical study the authors describe experiments that successfully demonstrated a technique for automatic reading of typewritten data, a process that has important implications for the future participation of developing countries in international information systems.

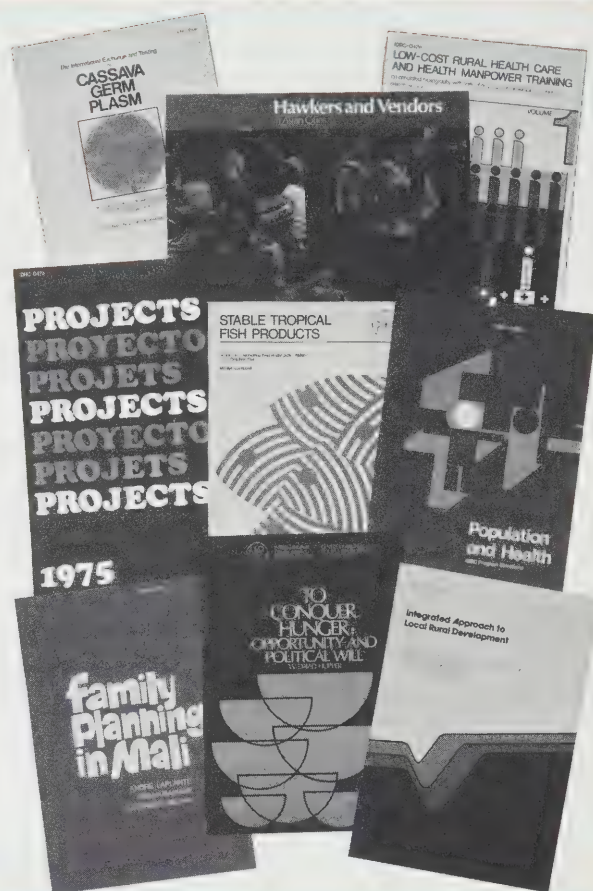
For more details on how to obtain these and other IDRC publications, see advertisement on the back cover of this issue.



INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population and health, information sciences, and social science and human resources. A list of past and current publications is available on request.

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Reports

Volume 5 Number 4

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CONTENTS

Making war on waste

Fish products should feed people before pets,
says W.H. Allsopp 3

Commentary

Barbadian writer John Wickham comments on the
artist's role in development 5

New approaches to rural-urban migration

Latin America, Asia and Africa get together to tackle
their housing problems, by Susana Amaya 6

Tropical forests: overexploited and underused

A new report calls for international action to
preserve the forests, by Michelle Hibler 8

In search of the mystery disease

Scientists are working against the clock in
Bangladesh, report by Bob Stanley 10

Triticale: closing the gap between scientist and farmer

A global review of where triticale came from ...
and where it's going, by Bob Stanley 12

Briefs

People, projects, events 15

Will it work, will it last, can I afford it?

What the world needs now is a good, cheap,
practical hand pump, says David Henry 16

Getting down to the roots

Stella Feferbaum reports from Cali on an
international root crops symposium 18

New publications 19

The IDRC Reports, a magazine about the work of the International Development Research Centre and related activities in the field of international development, is published quarterly at the Centre's head office, and is available on request from the Publications Division.

Established in 1970 by Act of the Canadian Parliament, the Centre is a public corporation supporting research designed to adapt science and technology to the specific needs of developing countries, and concentrating in the following fields: Agriculture, Food and Nutrition Sciences; Population and Health Sciences; Social Sciences and Human Resources; and Information Sciences.

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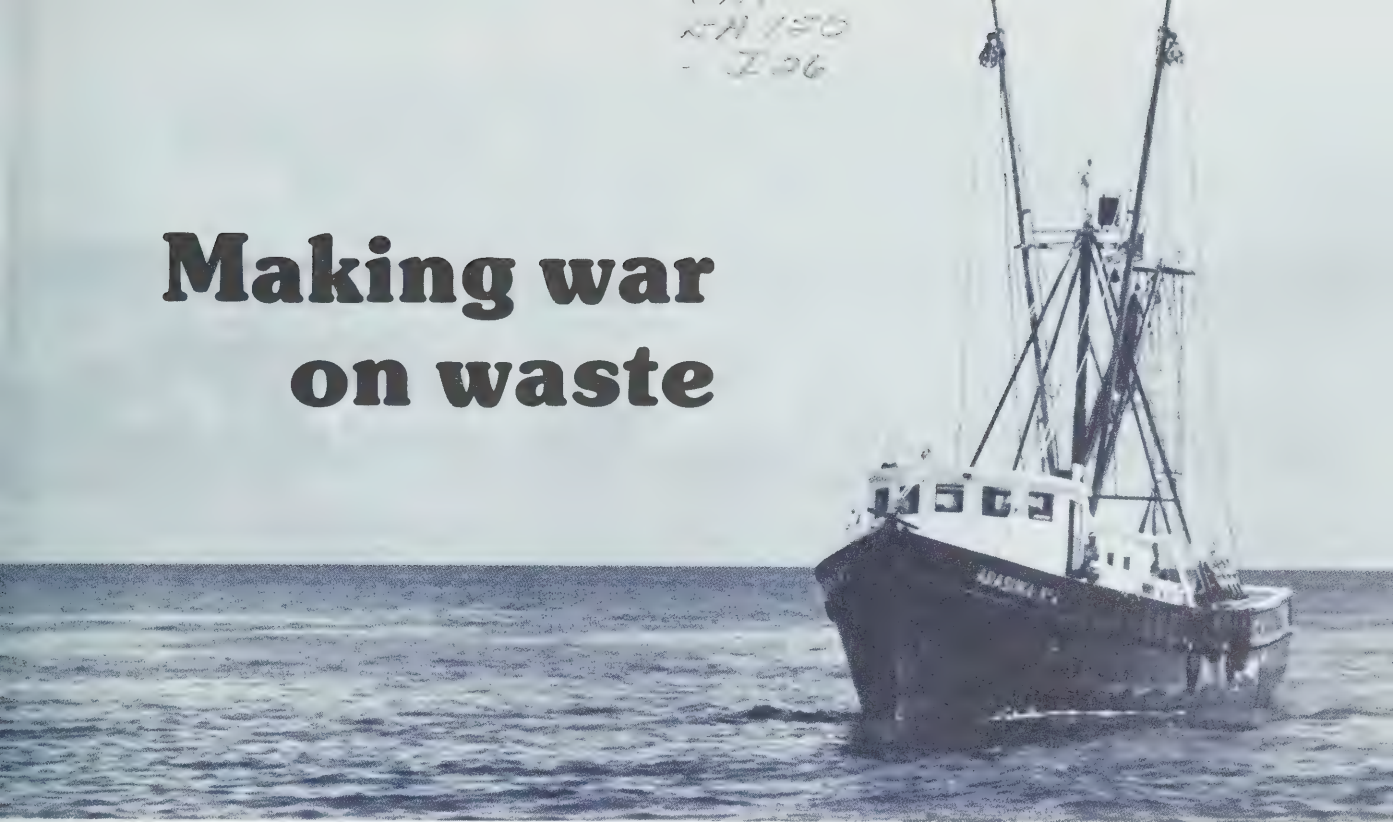
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Cover photo by Neill McKee: children are the principal victims of a mysterious disease now being studied in Bangladesh. See article page 10.

Making war on waste



Photos: Neill McKee

The world population increase is posing an unparalleled food dilemma for the 21st century. Yet every year millions of tons of fish that could provide protein for people, is being ground up to feed livestock in the industrialized countries, or, worse still, is simply thrown away. In the following article W.H. Allsopp, Associate Director, Fisheries, with the Centre's Agriculture, Food and Nutrition Sciences Division, explains how and why such waste occurs, examines some of the moral and political issues involved, and presents some practical solutions.

Until recently the conventional wisdom in many developing countries has been that the quickest and easiest way to develop a fishing industry is through fish meal production and other export products like shrimp, lobster and tuna. Inflation, the portents of the ongoing Law of the Sea Conference, and improvements in processing technology, however, have combined to bring a gradual change in policy that emphasizes the need for domestic self-sufficiency in food, and recognizes the value of fish products as an important source of protein.

One example of wasted fish resources is the shrimp trawling by-catch of fish. Wherever the outflow of large tropical rivers enriches the bottom feed organisms on a broad continental shelf outspread, the occurrence of large shrimp — sometimes called prawns — has given rise to shrimp trawling enterprises. For over 30 years such shrimp fisheries have been exploited by the "Gulf of Mexico" type of shrimp traw-

lers, which are mainly owned by American and Japanese companies. However, large quantities of fish are caught incidentally in the trawling operation, and this "by-catch" is usually discarded at sea, or in a few cases is converted to animal feed.

International shrimp trawling companies now fish in the Gulf of Mexico, and off the coasts of South America, East and West Africa, India and Southeast Asia. It has been estimated that the fish by-catch may total an annual average of at least 5 million tons of fish jettisoned in the tropical seas of the world, while 1 million tons of shrimp are landed worldwide.

Shrimp, not fish

Because it is difficult to accept that such fantastic waste occurs, the complexity of the problem should be clearly explained. The vessels are designed with a refrigerated hold capacity of 15 to 30 tons of shrimp. They have a crew of three to five, are highly powered (450 hp engines) and costly to operate. The capital cost of such vessels varies from US \$150,000 to \$250,000 with operating costs and crew payments depending on catch, efficiency and location. Shrimp trawlers operating off Guyana, for example, generally gross annual earnings equivalent to the initial investment on the vessel. This can be done (with resulting profits to owners and crew) only if the hold is filled with shrimp, not fish! Various factors such as temperature of the hold, crew size and time at sea, are designed exclusively for handling shrimp.

Further, the great bulk and variation of the fish that are caught make it impractic-

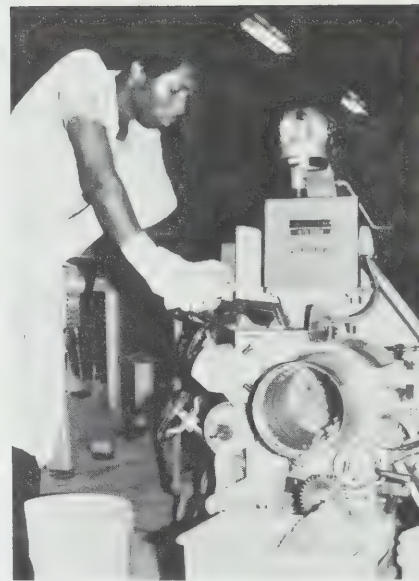
cal to accommodate the total by-catch with the present system. The value of this fish (about 10 cents/lb) compares adversely with the price of shrimp (at least \$1/lb). The fish is therefore thrown overboard in its stunned condition. It is eaten then by sharks, gulls and scavengers.

The problem is not only economic, but also technological. In the tropical seas as many as 50 fish species may be caught in a trawl. They vary in size, chemical content (white or oily) and some may even be poisonous. The quantity of fish caught will vary with the place (bottom type, depth and currents), time of day (fish are generally more active in daylight than shrimp) and time of year (the rainy season causes outflows from distant estuaries that affects the availability of fish). As some species of fish become mature and gravid, the chemical composition of the flesh and even its palatability varies. Generally the weight of shrimp caught is between 10 and 30 percent of the total catch landed. This mixed bag of fish would be difficult to process without some sorting between oily and white fish types. However, the fishing operation is generally done at night, the crew is too small and there is too little time between the landing of the twin trawls.

From the point of view of operational efficiency only major quantities of acceptable market fish can be considered for collection aboard or easy processing ashore. Assessments along the Guyana shelf estimated that about 200,000 tons of edible fish, consisting of eight major white flesh types, could be obtained annually from the fleet of between 175 and 210 trawlers. Yet the countries of the



Sorting the fish by-catch aboard the shrimp trawler "Arasuka" (photo previous page) off the coast of Guyana.



Scientists ashore experiment with new processing techniques.

Caribbean import the equivalent of 150,000 tons of fresh fish annually!

Unacceptable waste

Such a waste of consumable fish is unacceptable, and solutions for its satisfactory use are being sought throughout the tropical world. These approaches are considering ways of handling the fish at sea, systems for collecting and transportation from shrimp trawlers, and the processing of a mixed bag of species.

The development of shrimp-fish separator trawls has shown promise. Alternatives include the use of detached floating cod-ends (nets), and refrigerated sea water (RSW) tanks on the decks of trawlers in which the day's catch can be held. Both systems require the retrieval of the catch by a collection vessel operating along with the shrimp trawling fleet. The vessels with RSW systems used by the Pacific herring fleet off British Columbia are considered sufficiently adaptable for the exercise. However, until the bulk handling of the by-catch is proven practical and efficient, industrial scale processing ashore will not be readily applicable, since the landed cost of the fish will be too high, even before processing, for low-income consumers, who are the target population.

To test the practicality of using this fish, the Guyanese government required each shrimp trawler coming to the Port of Georgetown to land its last few days by-catch. This totalled about 2,400 tons a year, however the sudden volume of fish brought into the market created problems in handling, processing, cold storage, sales and distribution. In a tropical country so large a volume of fish is not easy to handle unless an efficient industrial infra-structure already exists. The resultant fish spoilage and waste leads to a spirit of frustrating discouragement both for the shore handlers and for the fishermen.

Since early 1973 the IDRC has been supporting the Guyanese government's efforts to solve these problems. Experiments in processing the mixed bag of fish using deboning machines have provided an extruded flesh quite free of bones, scales and skin. The waste (comprising fish bones and skin) can be converted to fish meal, while the comminuted fish flesh is now a new raw-material. Tests have been conducted in the project to make dried, spiced or salted products which are stable at normal temperatures, and can be packaged in sealed plastic bags and sold at low cost.

Additionally the project plans to make products of higher market value. That portion of the catch that comprises fish of higher consumer demand is to be processed as fillets or specialty products. These are intended to contribute appreciably to defraying the processing costs, thus permitting the bulk preparation of lower-cost stable fish products that are within the reach of rural communities where refrigerated storage is not widely available.

Similar approaches

At an IDRC-sponsored workshop in Thailand in 1974 similar situations were described in Southeast Asia. Parallel approaches are being made through fish technology laboratories in India, Thailand and Indonesia to solve the problem of the waste of the by-catch. It was pointed out that without any increase in fishing effort, more than 1 million tons could be available from the by-catch of shrimp trawling in that region.

The often published figures of fish production and the gap in protein requirements of the tropical belt of the developing world emphasize the obligation to utilize such incidental catches of fish — not for fish meal to feed livestock or pets, but for direct human consumption.

While the world's fish production has increased from 33.3 million tons in 1958 to 66 million tons in 1973, doubling in 15 years, there has been a decline in direct consumption of fish from 84 percent of the landed catch to 60 percent, with a comparative rise in industrial processing (for fish meal etc.) from 16 percent to 40 percent.

This means that the current trend is to convert to fish meal, almost the equivalent quantity of fish (26.2 million tons) as was directly consumed by man 15 years ago (28 million tons). The agonizing corollary of this is that the increased catch converted into fish meal has come largely from the oceans adjacent to protein-deficient developing countries, and sold to feed the livestock of the affluent nations of the world — in North America, Europe and Asia.

There is concern among the traditionally powerful high-seas fishing nations that the Law of the Sea Conference will limit their fish production. The grave concern of the developing countries, however, is that mechanized fishing off their shores removes large quantities of fish, much of which is wasted, while the remainder goes to countries where there is no food or protein shortage. Such fishing benefits neither the people nor the economy of the coastal states, and with the ever-increasing costs of technology, manufactured goods, services and fuel, there is little hope that they can compete with the established fishing nations.

With the new focus on self-sufficiency in food in the developing world, a more humane perspective is required by the advanced technologies of the industrialized world. Such a perspective should lead to concerted efforts to prevent such unacceptable "waste" of the valuable by-catch from tropical shrimp trawling as a valuable source of food for man. □

The artist and development

For the past 35 years John Wickham has worked as a meteorologist — in his home country of Barbados, in London, England, and in Geneva, Switzerland. But if you ask John Wickham what he is he'll tell you he is a writer. Meteorology may be his career, but writing is his vocation. So, in addition to being Senior Administrative Officer with the Caribbean Meteorological Institute in Barbados, he is also President of the Barbados Arts Council, editor of BIM — a 30-year-old literary magazine, author of numerous short stories, frequent contributor to Caribbean journals and is much requested as a lecturer on Caribbean literature.

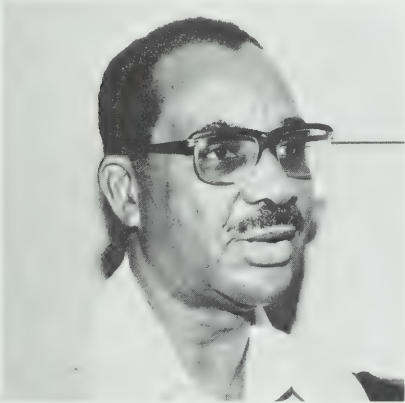


Photo: Neill McKee

This year Wickham was one of 20 individuals from developing countries to receive an IDRC Research Associate award. His assignment: to prepare a full-length work that will "reflect the social and physical landscape of Barbados". Why a research grant for a writer? Wickham is a writer with a mission. An articulate advocate of the importance of the artist's role in national development, he believes that true independence must be cultural as well as economic and political. Or, in the words of Guyana's Prime Minister Burnham: "If you are not too poor to build roads, you are not too poor to sponsor the arts."

The advance of the islands of the English-speaking Caribbean from colonial units of population to self-governing entities has been seen in terms which are mainly political. The independence that has been achieved finds its expression in formal constitutional terms and in the transfer of the decision-making power from the corridors of Whitehall, London, to Whitehall, Port of Spain and counterpart offices in Bridgetown and Kingston. But this transfer cannot honestly be said to have been accompanied either by economic independence or, even more importantly, by the emergence of any vigorous national spirit. The islands remain, in spite of their tenancy of seats in the United Nations, essentially what they have been ever since the Colombian accident: victims of forces outside their control. In fact, the events of each passing year — oil crisis, British entry into the European Economic Community — have served to emphasize the continuing dependent status of the islands.

Real and total independence, that is, the resolution to act independently in enlightened self-interest and to undertake the management of the at present uncontrolled outside forces, demands a harnessing of the national energy and a summoning up of the national will that have not yet (with a single exception) been seriously attempted in the former British colonial territories. It is a personal view that real independence has so far eluded the nations in question largely because they have failed to mobilize the total national energy and, particularly, because they have omitted to recognize the valuable resource of cultural and artistic expression.

In the published lectures which Professor John Kenneth Galbraith gave (when he was US Ambassador to India) on economic development, that distinguished economist made the following points, among others: "We think of economic development as the investment of present resources for increased future production . . . but not only scientists, engineers, and doctors are good educational investments. There are surprising returns to esoteric and even exotic forms of knowledge. The linguist obviously maintains the avenues to the technology of other cultures. Literacy leads to a demand for writers who can supply its market. And the writer adds to the Gross National Product in accordance with sales precisely as does the vegetable grower or printer.

"Not even the artist, as an object of investment, can be ignored. One of the most successful industries in modern India is motion picture production. This

industry flourishes only in the presence of a secure artistic tradition in the theatre, music, ballet and the visual arts. It requires reasonably competent artists to produce bad pictures; it takes good ones to produce good pictures. No one ever invested in an artist with a view to helping the balance of payments. Yet India's artistic tradition is a considerable source of foreign exchange."

When he addressed the opening meeting of Caribbean writers at their symposium at Carifesta '72, Prime Minister Burnham of Guyana pointed forcefully to the crucial importance of promoting the arts: "It is my conviction," he said, "that people who have to borrow stories are not a people. It is my conviction that people who have to use their imaginations on other people's stories are not people . . . Ours is not a rich community in financial terms, but a country that is too poor to provide the environment for the promulgation and formalization of culture in that country is too poor to survive. If you are not too poor to build roads, you are not too poor to sponsor the arts. If you are not too poor to take a jet to far off places to beg, cap in hand, you are not too poor to sponsor the arts."

The political coming of age of these islands has offered their governments the opportunity to present their individual cases to the world. The governments, all of them, have been able to prick the collective conscience of the richer nations and to secure the benefit of assistance of one kind or another in attacking the problems they have identified. For, in this connection, it is essential to bear in mind that a basic principle in the arrangements for securing foreign aid, whether bilateral or multilateral, is that the requesting country needs to identify and specify the area of its economy to which the assistance treatment is to be applied. In other words, the recipient government establishes its own priorities. Thus the overwhelming emphasis that national planning authorities have placed on the development of their economic infrastructure — the building of roads and airports, the development of port facilities and agriculture, the training of technicians — is an expression of their scale of values and an indication of their continuing disregard of the import of Mr Burnham's thesis.

Yet this disregard is not unexpected. For, given the colonial traditions of Caribbean societies and the tendency nurtured by the long period of dependent status to despise the local and revere the foreign, it is entirely understandable that the last place the nations would look for solutions to their prob-

lems would be in their own backyards. But it is time to look homeward, to put an end to our childishness, to put away our sense of shame and to conduct ourselves as men. Our national strength is being eroded by our self-reproach and it is the Caribbean artist who can restore our self respect by bringing us to a knowledge of ourselves, by showing us the reflection of our faces, our landscape, our history and our strength.

The Caribbean artist has not in general been encouraged to play his full part in the nation-building exercise. His work is often regarded as being of interest to only a few and his potential contribution remains undemanded at the same time as the importance of that contribution increases. V.S. Naipaul, the Trinidad writer, has made the point that, more than most, the West Indian needs his writers to tell him who he is.

A striking anomaly of the present situation is that at the same time as the need for the development of a national consciousness is being stressed, the bombardment continues of the popular mind, the most plastic minds in the community, by advertising and entertainment designed for foreign appetites and life styles. It is therefore in the area of media communications, television, radio and the popular press, that the need for corrective work is most urgent. It is here, that the particular talents of the artist need to be exercised. Caribbean people need to see themselves and their lives treated with sympathy and understanding and intelligence in the media. The serial stories and features produced for North American and European audiences exert an influence on the Caribbean mind which their total irrelevance should have forbidden.

Caribbean art and the Caribbean artist have the capacity to record and interpret the Caribbean personality to itself. If they are encouraged to do so, they can not only produce the distillate from which the people can extract their meaning and so ensure their strength, but also contribute to the repair of the centuries-old fragmentation and separation of these island communities. The continuing reluctance to make use of the creative energy of Caribbean artists to fortify the will and spirit of the Caribbean turns out to be a waste of a valuable national resource. The two Caribbean Festivals of Creative Arts (Carifesta) held so far (Guyana, 1972 and Jamaica, 1976) are indications that the message is beginning to get through the static. That message is that real development aims at the creation of a Caribbean personality that carries no edge of apology nor trace of bombast but only the simple assurance of its own uniqueness and importance to itself. The efficient mobilization of the national energy towards this end requires the use of artistic skills and perceptions which are readily available. All that is lacking is the will to use them. □

rura

For the last one hundred years coffee has dominated the economy of tiny El Salvador, the second smallest country in Latin America. Coffee's supremacy has been challenged only since the 1950s by cotton, which is now established as a second major export commodity. The pre-eminence of these two crops has literally transformed the country — and the social consequences for the landless poor have been little short of disastrous.

The introduction of cotton served only to reinforce an already export-oriented agrarian structure, and, in the name of efficiency, brought about a further concentration of land in the hands of a few wealthy landowners. For the mass of landless peasant farmers living in the central highlands and the coastal plains, where the great coffee and cotton estates are located, there was no choice but to leave. Shutout of land ownership, they migrated in their thousands to the major coastal cities — San Salvador, Santa Ana, San Miguel, Usulután and Sonsonate.

In the cities they fared little better. Lacking money, they could not afford to buy housing built primarily with the upper and middle income groups in mind. Lacking land, they could not build homes to suit their own needs. Some simply became transients. Others found their way into already overcrowded slums, where they could afford the rent if they could find work. Still others reacted bitterly by seizing any open land on the city perimeter and establishing squatter communities, with homes built of scrap materials and no basic services such as clean water supply and sewers.

Today almost two-thirds of El Salvador's urban population is made up of slum dwellers — the majority of whom have at one time been driven off the land by force of economic circumstances.

The scenario is not new. It is not unique to El Salvador, nor indeed to Latin America. It is a depressingly familiar story that is repeated, with only minor variations in plot, throughout most

of the developing world. Often it is a legacy left by a departed colonial administration interested only in cash crops. Sometimes it is simply one of the unforeseen by-products of a natural desire to develop maximum production for the export markets.

The story of El Salvador is related in a report drawn up by a team of researchers from the El Salvador Foundation for Development and Minimal Housing over the past two years. Along with researchers in six other Latin American countries they have been studying the root causes of urban housing problems, evaluating such housing policies as already exist and preparing recommendations for the implementation of the most effective means of dealing with the problems.

The study, which was coordinated by the Inter-American Planning Society (Sociedad Interamericana de Planificación, SIAP) with the help of a research grant from the IDRC, was completed in April. The next stage, already under way, is the publication and dissemination of the researchers' findings in a series of reports, the first dealing with comparisons of housing situations in different countries (from which the El Salvador example is taken), the second with policies and the third with agrarian and urban reforms.

Although El Salvador, because of its size and density of population (second only to Haiti in the region at 177 inhabitants per square kilometre) differs from some of the other countries participating in the study, its urban housing situation is in many ways typical. Paraguay, for example, a landlocked country 20 times the size of El Salvador, yet with a smaller population, faces essentially the same problems in its capital city of Asunción, according to the report prepared by the Paraguayan Center for Sociological Study.

Perhaps because it is not blessed with El Salvador's rich volcanic soil, Paraguay has a somewhat more diversified agricultural economy, but the land is still

New approaches to urban migration

Susana Amaya

concentrated in the hands of a few wealthy landowners. A series of serious internal conflicts between the late nineteenth century and the early 1950s intensified the problem, as thousands of migrants flooded into Asuncion, often en route for neighbouring Argentina. The growth of the capital has been, as a result, chaotic and unplanned.

Various attempts were made to instigate new agrarian and urban policies, but these had little or no effect, in spite of a new constitution that emphasized the social role of property and recognized the function of government in the direction of housing services. The small amount of new housing available was priced beyond the reach of two-thirds of the people. As a result, the report states, there is a need for the construction of more than 10,000 new housing units per year simply in order to keep up with the growth of population and to replace existing deteriorated property.

These and the reports of the other participating national institutions will be published and disseminated early in 1977. But what will be the result? They are, after all, only studies. They contain many recommendations for improvements, but these are binding on no-one. The optimistic answer is to be found in Asia, where the Centre supported an earlier, similar study involving collaborating institutions in eight countries.

That study was completed in 1975 (see *IDRC Reports* Vol. 4 No. 4) amid enthusiastic responses from the participants. They spoke of a "solidarity and esprit de corps" that would be useful for future cooperation. The exchange of experiences, they said, had been extremely beneficial, and the contacts made would last beyond the lifetime of the project. In Hong Kong that country's study promptly became basic reading for the University of Hong Kong's housing management course, and was adopted as a background manual for the newly formed Housing Department.

Recently there has also been recognition that the problems of the urban poor,



Older housing in many cities is overcrowded, sub-standard and even in danger of collapse...

...but new modern buildings are not always the solution, even if the poor can afford to live in them.



particularly squatter communities, are not going to be solved by conventional means. There is a growing trend to attempt to upgrade slum areas and squatter sites as an alternative to relocation or other more draconian measures. Such schemes involve the provision of basic services to existing communities and new home sites — services such as drinking water, sewers, electricity and transportation — and assisting the inhabitants to improve or build their own houses. Attempts are also made to locate new sites near factories and other job sources. A variety of such sites-and-services "packages" are now being funded by the World Bank in eight developing countries — including El Salvador.

In order to gauge the impact of these approaches, the Centre is cooperating with the Bank and UNICEF in support of an evaluation of three of the projects, in El Salvador (where the work is being carried out by the same team that prepared the low-cost housing study in that country), in Senegal and in Zambia. The extent to which the goals of the programs are being met will be determined in each country through surveys, observation and case studies, involving both the people living on the sites and those in neighbouring communities affected by the innovations.

More studies, more reports, more talk. But all are necessary steps if the past mistakes of unplanned cities are to be rectified and repetition avoided. At the recent United Nations conference on human settlements in Vancouver many of the delegates called for city planning on a more human scale, and favoured an emphasis on self-help building technologies. Such studies, and the networks of planners they create, bring such ideals a little closer to realization. □

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Photos: Jaime Rojas

Tropical forests:

OVEREXPLOITED AND UNDERUSED

Michelle Hibler

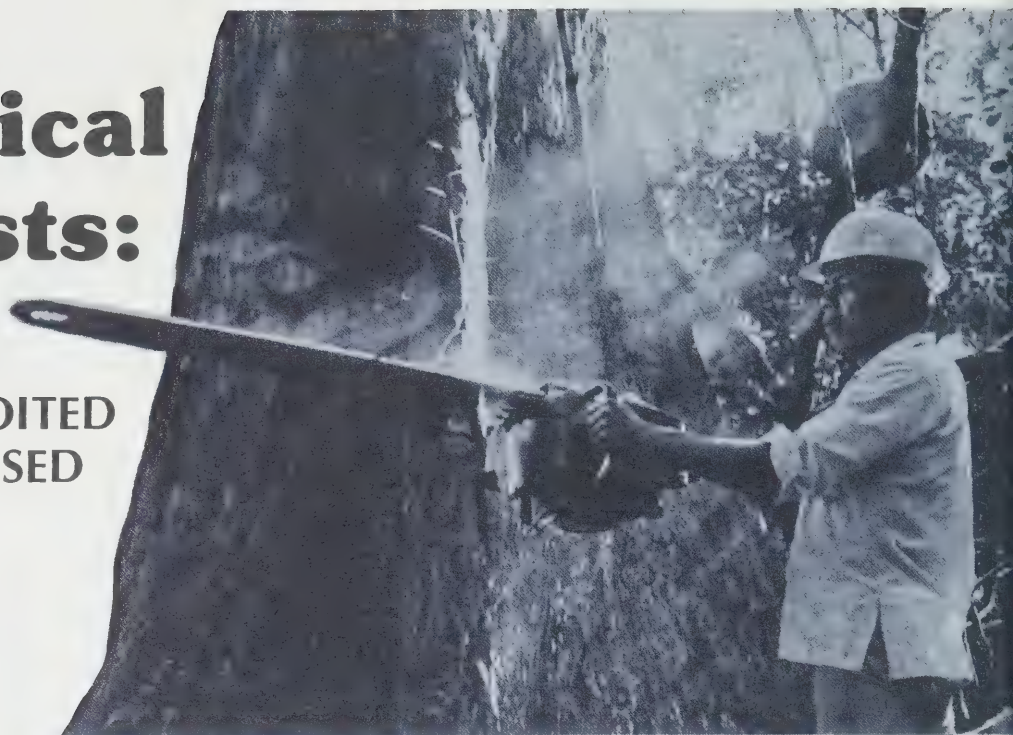


Photo: Ron Poling

In the year 1402 the Emperor Tamerlane hid his elephants in the deep oak forest surrounding what is now Ankara, Turkey, in order to capture the fortress there. Today he would have difficulty in concealing so much as a goat among the thin young trees around the city. Except for some parkland, the countryside is now bare. Similarly in Peru, Pakistan, Algeria and elsewhere, forests have given way to deserts.

About one-third of the earth's land surface is too dry, too cold, too steep or too sterile to sustain plant growth. In addition to these naturally barren areas, the United Nations Environmental Programme estimates that one billion hectares of tropical forests have been turned into unproductive wastelands. And it is widely predicted that within the next 25 to 30 years, most of the humid tropical forest as it now exists will disappear.

During 1976 the IDRC sponsored meetings between Centre staff, consultants and forestry experts in order to identify gaps in world forestry research and training, and to formulate research programs that would increase the contribution of trees to the economic, social and environmental welfare of the people of the tropics. The recent report of this project for the identification of tropical forestry research priorities pinpoints the reasons why the tropical forest estate is shrinking.

In the very wet areas, trees are usually the most productive source of food, feed and fuel. Small farmers throughout the humid tropics have for centuries practiced shifting cultivation. As populations increase, however, the period of fallow becomes shorter and soil fertility is not fully restored. New clearings are created and abandoned with ever-increasing

speed; in the Far East alone, more than nine million hectares of forest are felled each year to make way for shifting cultivation. If all goes well, brush and forest re-establish themselves, but too often the humus layer is washed away by rains and the sub-soil baked into a brick-like mass.

In areas of ample but seasonal rainfall, the forest is quickly cleared to make room for agriculture. Under the accompanying onslaught of an increasing demand for construction and fire wood, the trees in the surrounding drier areas are also quickly disappearing. Reforestation efforts are jeopardized by herds of hungry livestock and the surviving saplings are often destroyed by annual grassfires. On very dry land, however, deep-rooted trees bearing fruit and fodder are among the hardiest vegetation, once established.

Another kind of attack on the forest is mounted by loggers in search of highly valued trees such as mahogany and teak. Timber exports by developing countries have been steadily rising since the 19th century and more than trebled during the decade started in 1962. In Indonesia, for instance, log exports soared from 1.5 million cubic metres to 18 million between 1968 and 1974.

But of the hundreds of species of trees found in tropical forests, only a few possess the desired characteristics. Loggers, selecting only the best, leave the worst to reproduce. In the harvesting process, many of the remaining trees are damaged or destroyed, further degrading the forest. And, as the exports are usually in the form of roundwood, rather than as finished products, the country whose forest resources are being liquidated profits little.

Somewhat ironically, if the tropical forest is overexploited, it is also underused. Tropical forests cover one-third of the world's forested area and yet they contain almost as much wood as their larger temperate counterparts. Their harvesting, however, accounts for little more than 10 percent of the world's industrial wood production, and this despite the optimum growing conditions of the tropics — year round growing season, abundant rainfall and high temperatures. In terms of the producing tropical countries, while half their land area is forested, forest products contribute only about five percent of the value of all renewable resources produced in these countries.

"Yet," says John Bene, project team leader, "the well-managed tropical forest will produce up to four times more fibre than the best man-made temperate forest, and up to 35 times more fibre than the unmanaged tropical forest." Sound forest management would not only increase the productivity and yield of the tropical forest, but would also help to preserve and even improve the delicate tropical soils.

For instance, logging operations and the transport of primary products in tropical forests are largely destructive and inefficient. Improved harvesting methods, training for local staff and adaptive technology could do much to increase the efficiency of operations and safeguard the forest.

At a time of world energy shortages the depletion of renewable sources is causing serious concern. In 1970, wood and its derivatives (methanol, gas and charcoal) supplied seven percent of the world's total energy consumption — more than three times the energy gener-

ated by hydroelectric power. The total energy available in the unused annual increment of tropical forest could, however, be equal to nearly half of the world's energy consumption.

The export of roundwood which, according to the FAO, accounts for 70 percent of all wood exported by tropical countries, deprives these countries of the employment and foreign exchange that secondary manufacturing industries would provide. The development of appropriate technologies for tropical woods would not only increase employment opportunities and the value of the product exported, but could also promote a better utilization of presently unused species.

To avoid losses created by creaming-off a few tree species for export, reduce logging costs and increase forest revenue, manufacturing processes and markets must be developed that tolerate mixes of different woods. New pulp-making processes may be adopted to supply the tropical countries' paper needs which, although less than one percent of the consumption of Canada or the USA, is usually imported.

It is also technically feasible to produce synthetic plastic fibres and rubber from wood. By hydrolysis, wood can be converted into edible sugars from which protein-rich food and feed can be produced. "These processes are not quite competitive with present costs of cane sugar and soybean meal," says the report, "but slight improvements in the manufacturing processes or a sudden rise in the price of agricultural produce would justify the use of wood for human and animal consumption."

Equally valuable are the non-wood products of the forest — including fruits and nuts, latex, oils, dyes, gums, leaves for forage and spices. Collectively, the minor products of plants and animals found in tropical forests are often the main cash crop of forest communities.

The extent to which the production, processing and sale of forest products can be increased is, however, subject to certain limitations. Many of these constraints rest on a lack of knowledge about the resources, the people affected and the institutions concerned.

A prime consideration in greater exploitation and use of the forest is to safeguard its value to man, particularly to indigenous populations living in the forest. Any new land use must consider the social and economic consequences for these populations and the prevailing attitudes to the forest.

Little is known about the extent and nature of the tropical forest resources themselves. Barely more than 10 percent of these forests have been inventoried and the surveys done generally list only the currently valuable species. Tropical forest inventories will need to include data such as population density, kinds of cultivation, accessibility of the forest and so on. Of even greater importance is the classification of land according to its

potential uses whether agriculture, forestry, wildlife or recreation.

The report also lists as priorities a better understanding of the ecological effects of forest manipulation — what happens when forests are cut or interfered with and the forest's potential for repairing damage already done, such as for dune fixation. The formulation of sound forest policy and the implementation of effective administration as well as forestry education and training are equally essential. Probably, however, the most rapid benefit to the people in developing countries would accrue from research on how to implement existing knowledge.

This research will need to be geared to the three existing types of forest — natural, man-made and as part of farming systems. The last, called agro-forestry, is particularly promising.

Only 11 percent of the land in the tropics is flat enough to be worked by the plow. One-quarter of the land is too infertile for agriculture. The remainder, although too dry, too rocky or too steep to be called arable land, will nevertheless support trees alone, or trees in combination with agricultural crops and animals.

Through agro-forestry, shifting cultivation could be upgraded to sustain continued production on less fertile land, and crops would be grown in presently unproductive areas (see *The IDRC Reports*, Vol. 4 No. 4). For instance, using quick-growing trees, a commercial tree crop could be grown for wood in less than 10 years and replace bush fallow while restoring soil fertility.

The possibility of improving total

production by combining trees with crops and livestock has been demonstrated in many parts of the tropics and there is little doubt that agro-forestry could be introduced to stretches of land where agriculture cannot be practiced at present. The taungya system of rehabilitating logged areas by growing food for short periods between newly planted trees was introduced in Nigeria some 50 years ago. The fast-growing species planted have significantly increased forest production. Better management has attracted more game, an important source of protein. And experimentation is now under way to introduce giant edible snails under the trees. Similarly, several Asian and Latin-American countries are conducting research on the interaction of agriculture, forestry and animal husbandry.

To support and encourage research in agro-forestry, the report recommends the creation of an internationally funded "support unit." Included in the unit's objectives would be the acquisition and dissemination of information, the coordination and support of research and extension projects on agro-forestry systems, particularly those that would benefit rural peoples socially and economically without harming the environment, and the encouragement of training in this field.

Says the report: "A new front can and should be opened up on the war against hunger, inadequate shelter and environmental degradation. This war can be fought with weapons that have been in the arsenal of rural people since time immemorial and no radical change in their lifestyle will be required." □

Egypt — a woman transplants casuarina seedlings that will one day provide shelter against the desert wind for much-needed agricultural land.





Young girl makes a pretty picture beside the village well — but the well is unused and the water in her jar comes from the communal pond (below) where the villagers also bathe and wash their clothes, linen and floor mats.



Field assistants like Mr Abu Shama go regularly to all the villages checking on the health of mothers and children.



In search of the mystery disease

Bob Stanley

Dr Rahaman and two of the research team outside their simple headquarters in Teknaf.



The southernmost point of Bangladesh is a long narrow peninsula that runs almost parallel with the main coastline. On one side the peninsula faces the blue waters of the Bay of Bengal, and on the other the hills of neighbouring Burma loom across the inlet.

Here is Teknaf — rural, isolated, far from the country's main centres of population — almost a romantic setting. But what happened here in 1972 was anything but romantic. That year, and the following year, the area was hit by epidemics of a mysterious disease that resembled dysentery, but proved to be resistant to all available antibiotics.

Hardest hit was the offshore island of St Martin, where over one-third of the people were attacked, and two percent of the population died. Most susceptible were small children — 40 percent of those under the age of six did not survive the disease.

In the capital, Dacca, the Cholera Research Laboratory was able to identify the mysterious killer as *Shigella dysenteriae* Type 1, or Shiga's bacillus. An insignificant cause of dysentery before the 1971 war of independence, it now emerged on an epidemic scale in various parts of the country. The bacteria was particularly virulent, with an attack rate four times that of other shigellas, and posed the greatest threat to young children and to the elderly.

The government of Bangladesh was quick to act. A team of investigators from the Cholera Research Laboratory was flown to St Martin Island, and, following on their report, a centre was set up in Teknaf to study the disease. Because of its rural nature, lack of basic health facilities, previous exposure to the disease and its physical isolation from the rest of the country, the area was considered an ideal location to study both the epidemiology and bacteriology of shigellosis, and the optimal methods of intervention and treatment.

Funded initially by UNICEF, the Teknaf Dysentery Project received a three-year grant from the IDRC last year. Even at this early stage the results are impressive. Dr M. Mujibir Rahaman and his research team have deliberately kept their presence in the area as "low profile" as possible. A small building constructed of local materials houses the simple clinic where Dr Ebadul Huq examines dysentery patients — in the first 18 months the team treated 1,700 cases of shigellosis and confirmed 700 cases of the mysterious Type 1.

In the same building laboratory technician Abdul Huq is able to culture samples with a kerosene-powered incubator (there is no electricity supply in the area) and to make identifications on the spot. The same low-key approach is taken by the field assistants who visit all the villages in the area at regular intervals to chart the health of some 4,000 families. A complete census of the area was carried out during 1975, at which time information was also

Hope and anxiety co-exist in Bangladesh. A variety of economic and social problems cause anxiety. Projects such as the research program described here raise hopes that the problems can be overcome.

There was hope, too, in the fact that Bangladesh was the only country in Asia to record double-digit economic growth last year. According to official figures, Bangladesh recorded a 12 percent growth rate in the year ending June 1976.

Like many Asian countries Bangladesh concentrates its development efforts in the rural areas where the bulk of the population lives. As part of this effort, the government has decreed that senior public officials must spend five days a month, and junior officials 15 days a month, in the villages, where they will help the rural people to help themselves.

gathered on family diet, sources of drinking water and hygienic practices.

It is these three factors — water, nutrition and basic hygiene — that Dr Rahaman believes may provide the key to the high incidence of shigella dysentery in the area. He has already established a tentative link between water supply and incidence of the disease. A survey shows that families taking water from the "tanks" or ponds where people also bathe and wash their clothes had a significantly higher rate of shigellosis than those using the community wells.

The implications are important. Dr Rahaman explains: "Most scientists will tell you that shigella is not a waterborne infection," he says, "but this has been disproved in this community at least. It now looks as if water is a much more important factor than person-to-person contact." The discovery has opened up several new lines of research.

The project team is also searching for a link between malnutrition and susceptibility to the disease. History provides ample evidence to support the theory. Two hundred year-old records from the Madras famine of 1778 state that the main cause of death at that time was dysentery. More recently, in 1918, dysentery was identified as the main killer at the time of a major famine in Calcutta. The records do not show whether or not it was the lethal shigella Type 1, but as Dr Rahaman bluntly observes: "If a malnourished child is attacked by Shiga's bacillus his chance of survival is rather poor."

More than 1,000 children below the age of six are kept under continuing surveillance by the researchers, who keep records of their height, weight and general health in a constant alert for

signs of the disease. In a nearby refugee camp some 150 severely malnourished children were provided with a good diet of local foods — the mortality rate decreased dramatically. These and other data could be invaluable in saving the lives of children in case of a future epidemic.

An outbreak of measles in one of the villages provided the team with the opportunity to fit another piece to the puzzle. The infant mortality rate from measles was unusually high, and Dr Rahaman suspected that the disease was making the children more susceptible to shigellosis. His suspicions were confirmed by the village "quack" (a respected title in rural Bangladesh) who had himself treated many of the sick children. As a result, a study has begun to try to establish if there is a definite relationship between measles and shigellosis.

One of the project team's main priorities is the prevention of disease. This involves providing some villages with adequate latrines, soap, and a supply of clean drinking water. Above all is the need for education in matters of basic health and hygiene to ensure that the people understand the need for these practices. How effective these measures can be in the prevention of an epidemic will be seen only if and when there is another major outbreak.

That remains the big question for the research team in Teknaf and their colleagues in Dacca, who are working to produce an effective and economical treatment for the disease under the project's co-leader Dr K.M.S. Aziz. Will there be another outbreak of epidemic proportions? If so when, and above all, why? For Type 1 is indeed a mystery disease.

It was the same shigella organism, says Dr Rahaman, that caused a major pandemic in Central America in 1969-70. That outbreak spread rapidly, as far north as California and as far south as El Salvador. It infected some six to seven million people, about six percent of whom died. Then the disease disappeared as mysteriously as it had come.

Dr Rahaman is afraid that it will appear again in Bangladesh on an epidemic scale, because the ecological conditions there are ideally suited to such diseases. Worse, the disease could break out across national borders and become a pandemic if it were not quickly brought under control, he adds. And that leads to the project's final objective: "To see how one can tackle a major epidemic in a real situation."

If Dr Rahaman is right, it becomes a matter of time. He believes that within three years they will be able to identify and control the causes of major shigella outbreaks. But it will take time, and meanwhile, he adds: "In Teknaf we have been able to isolate the Type 1 organism. We know it is here in the community, but so far it has not broken out again in major epidemics..." □



TRITICALE:

Closing the gap between scientist and farmer

Bob Stanley

As Nobel Prize-winning scientist Norman Borlaug tells it, it was near dawn one warm March Mexican night in 1967 when capricious mother nature played one of those tricks that help to keep scientists humble.

"While scientific man was still in bed," says Borlaug, "one promiscuous, venturesome stray wheat pollen grain with a potent and valuable 'genetic load' from the nearby wheat breeding plots floated across the road under cover of darkness and fertilized a sad but permissive tall, sterile, degenerate triticales plant."

Even couched in such unscientific language, it does not sound like a particularly significant event. But, says Borlaug, it was the "largest and most important step" down the long road of triticales research. One year and two generations later the scientists began noticing some unusually promising plants in their triticales plots — plants resulting from that "illicit" cross and exhibiting many of the characteristics that decades of intensive research had been unable to produce.

Ruefully, Borlaug adds: "This seems to me to be nature's way of telling scientists not to become too arrogant."

Yet for all that, triticales represents a remarkable scientific achievement. It is the first truly "man-made" cereal plant. A cross between wheat and rye, it combines the high yield and nutritional value of one with the hardiness and adaptability of the other — and it is now showing the potential to outshine both in all departments. To understand the lengthy development of triticales (the word comes from the generic names of wheat and rye, *Triticum* and *Secale*, and is pronounced "trit-ee-kay-lee") and to appreciate the significance of that Mexi-

can accident, it is necessary to go back 100 years — to Scotland.

It was there that botanist A. Stephen Wilson produced the first known cross between wheat and rye, reporting to the Edinburgh Botanical Society that, while the plant exhibited some of the properties of both its parents, it was unfortunately sterile. The first fertile cross was made in 1888 by a German breeder named Rimpau. However, the plant was a reluctant breeder and poor in appearance, and was thus regarded as little more than a curiosity for almost another 50 years.

Finally, in 1937 came the first breakthrough. A French scientist, Pierre Givaudron, developed a technique for doubling the chromosomes of sterile triticales (the name had been officially adopted two years earlier) by treating the hybrid seedlings with an alkaloid solution called colchicine. Givaudron's discovery made possible the routine production of fertile triticales, and opened the door to the development of a new potential cereal crop.

All that remained, then, was the painstaking process of breeding improved varieties of the new cereal — a process that in wheat required from 20,000 to 30,000 years! Triticales is not a single plant, like many other members of the grass family it is capable of an almost infinite number of variations. Like good detectives the plant breeders must use a combination of science, intuition and luck to breed in the desired characteristics and breed out the undesirable ones.

Much of the pioneer work in the "modern era" of triticales research was done in Canada at the University of Manitoba, beginning in 1954. Bringing together the world's first comprehensive collection of primary (first generation)

triticales, the Manitoba team began producing scores of new varieties. This marked the beginning of an unprecedented international research effort to bring triticales to the point of successful commercial production. In 1963 began a program of cooperation between the Manitoba group and the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), the international maize and wheat improvement centre in Mexico, where Borlaug had developed the dwarf wheat strains that won him the Nobel Prize.

The problems facing the researchers were formidable. While it was generally resistant to rust, triticales proved to be susceptible to a variety of other diseases. It had inherited rye's ability to withstand cold, altitude and poor, sandy, acidic soils, but its yield was barely half that of the best wheats. It also tended to produce a shrivelled, malformed seed, and under the Mexican sun the Northern-bred plants would grow impossibly tall, and eventually fall over.

Nature lent science a hand in 1967 with that freak cross between a dwarf Mexican wheat and a triticales known only as X308, resulting in a new strain now known as Armadillo. The scientists were quick to capitalize on the happy accident, and advanced Armadillo strains proved to be superior in almost every way to earlier triticales, leading the way with higher yields, shorter straw length and improved nutritional quality. Much has also been done to solve the problem of shrivelled seeds, and the new varieties are also free of ergot, a poisonous fungus that affected some of the earlier varieties.

Today Dr Edward Larter, who heads the Manitoba research team, is able to say that, in a scientific sense, there are

no major obstacles left to be overcome. Not that the work is complete — far from it. There is still plenty of room for improvement, says Dr Larter, and he predicts that within five years many of the new lines currently being developed will easily outproduce today's crops.

The same optimism is echoed by Dr Leonard Shebeski, the University of Manitoba's dean of agriculture, who points out that as far back as 1973 their top triticales were outyielding top feed wheats. He foresees triticales in serious competition with bread wheats as one of the world's most important food crops within a dozen years.

At CIMMYT in Mexico, Dr Frank Zillinsky sees the most important work now as the development of the most rugged, high-yielding varieties to provide more food for the world's hungry people, and getting those varieties into the fields of farmers in the developing countries. "We've got to close the gap between the scientist and the farmer," he says. "Here learned papers don't mean a thing. All that counts is to produce food."

To fulfill Zillinsky's vision, however, meant finding some way to compensate for triticales' lack of natural evolution; in a matter of a few decades it had not had the opportunity to develop the versatility that other plants had acquired through thousands of years of constant cultivation. As a result it would do well in test plots in a controlled environment, but adapted poorly to changes in latitude and climate. In 1969 CIMMYT began an international triticales testing program, which received a boost two years later when the Canadian International Development Agency (CIDA) put up \$3.25 million to be used for the development of triticales as a food crop for the countries of the Third World. The newly-formed IDRC was asked to manage the program.

By 1975 CIMMYT had cooperators in 73 countries, 338 trials were being carried out, and the demand for seed far outstripped the supply. The result has been an evolutionary shortcut that in just five years has provided a vastly expanded gene pool and a remarkable improvement in triticales' ability to adapt to environments as widely different as the arid lands of the Middle East or the foothills of the Himalayas.



Food technologist at the Holetta Research Station in Ethiopia conducts triticales protein analysis.

Today the IDRC in cooperation with CIMMYT and the University of Manitoba, supports a worldwide network of projects concerned with all aspects of triticales research, from agronomy and nutrition to utilization and information.

Perhaps nowhere is the need for increased self-sufficiency in food more urgently felt than in India, and it would be hard to find a more challenging testing ground for triticales than the Himalayan region of northern India. The agro-climatic conditions vary enormously. Farms are to be found at altitudes

ranging from 2,000 feet to 10,000 feet. Annual rainfall may vary from a few inches up to 10 feet, but most of it falls in the monsoons, not in the growing season. Soil types vary from acid to alkaline. Little wonder, then, that yields of cereals such as wheat and barley have been persistently low in unirrigated areas of the plains and the hills, or that triticales, with its potential for drought resistance, hardiness and high yields, should appeal to Indian agriculturalists in the region.

In 1974 the Indian Council of Agricultural Research (ICAR) asked for the IDRC's support in expanding an existing small-scale triticales improvement program. They had already demonstrated that a number of triticales could outyield some bread wheats under these conditions. The three-year project, now well under way, is aimed primarily at improving the standard of living of the small farmers who make up the bulk of the population in the region.

A wide range of spring and winter triticales is being tested under varying conditions, with the objective of producing lines that are high-yielding, disease resistant and nutritionally superior to traditional local grains. In addition, triticales that can do well here must be able to compete economically with other crops, and the flour produced should be suitable for making *chapati*, the unleavened bread that is a staple in many Indian homes.

This emphasis on the use of triticales in the home is best seen in Ethiopia, where, in addition to breeding, testing and selecting new varieties, researchers at the Holetta Research Station have experimented with the preparation of local foods. Triticales has been substituted for the traditional ingredients in products such as *enjera* and *kemuse*, local forms of bread, and triticales has been made

Ethiopia — *kemuse* made the traditional way, and with the addition of triticales flour.



Ethiopian family enjoys a meal prepared from triticales: they won't feel hungry again quite so soon.



available to families in the area to be tested in their own kitchens.

This combination of laboratory and home trials has produced encouraging results, and the people generally find the new products to be better than those they had been used to. Most important in an area where wheat is a marginal crop and malnutrition is widespread, families reported that after eating a meal prepared from triticale they did not become hungry again as soon as they would after a meal of traditional foods.

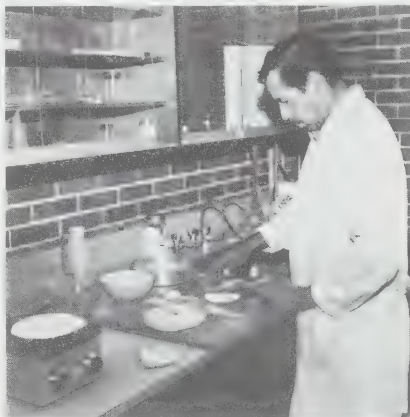
The project is now in its second phase, and although it is supported by IDRC funds, is run entirely without expatriate help. As work continues in breeding the most promising varieties for Ethiopia's ecological conditions, training local scientists and managers and developing new products, it may well be that Ethiopia will become the first developing country where triticale is accepted as a commercial cereal crop.

The commercial success of triticale, however, will depend to a large extent on its resistance to disease — particularly to rust, a fungal parasite that infects many plants, including wheat. The IDRC's Director of agriculture, food and nutrition sciences, Joseph Hulse, describes neighbouring Kenya as "a natural rust laboratory, since nowhere on earth are more species of rust fungi known to exist." Kenya was therefore an ideal location to develop rust-resistant varieties for the international triticale network.

At the National Plant Breeding Station at Njoro in the Kenyan Highlands, scientists deliberately inoculate promising triticale seedlings with rust spores. Those that exhibit the best resistance undergo yield trials. New varieties arriving from CIMMYT and Manitoba are subjected to similar treatment. It is simply survival of the fittest, and the attrition rate is high — of 1,600 varieties tested since 1974, just 62 superior varieties advanced to preliminary yield trials. Of the 161 outstanding varieties

included in the 1975-76 preliminary trials, 17 produced excellent results and will be tested next season in the national yield trials.

If the project can produce rust-resistant varieties, triticale could be grown with far less risk in many parts of Kenya where wheat is presently established, and also penetrate into the regions at higher altitude or with poorer soils where wheat is at best a marginal crop. Equally important, the samples of the most resistant varieties returned to



Experimenting with tortillas made from triticale flour at CIMMYT.

CIMMYT become valuable additions to the international triticale network.

Around the world the effort continues, and there is now little doubt in the minds of most researchers that it is only a matter of time before triticale becomes as familiar as other cereals on the world's grain markets. More important, it should become equally familiar in the chapatis and enjera breads of the developing countries — opening up marginal farmlands and providing much needed additional protein for the millions of people in rural areas for whom malnutrition is a normal state of existence.

If that sounds overly optimistic, consider the words of Dean Shebeski, of

Manitoba, who has worked with triticale for more than 20 years. He told an international triticale symposium in Mexico three years ago: "Over the next 15 years yields of triticale will improve much more rapidly than wheat, and should plateau at a level approximately 50 percent higher than those of wheat."

"This is no idle speculation. Surely the phenomenal improvement that has taken place in triticale in 10 short years ... should clearly indicate that with rapidly expanding programs and a quickly widening genetic base, with improved fertility and seed density, with improving worldwide cooperation, the improvement over the next 15 years will greatly surpass all improvements that so far have been attained."

There is one futuristic footnote to the triticale story. According to all the basic biology courses, wide crosses such as that between wheat and rye are all but certain to be as sterile as mules. The development of fertile triticale showed that this particular "law of nature" could be at least bent, if not broken, and in doing so it opened up new vistas for plant scientists.

At the Prairie Research Laboratory in Saskatoon, Canada, the IDRC is funding an attempt to produce a fertile cross between sorghum and maize, a cross that would combine sorghum's remarkable resistance to drought and poor soils with the high yields and pest resistance of maize. Both plants are staples in many parts of the Third World, and there have been numerous attempts to produce a fertile hybrid in the past — all unsuccessful.

The Prairie Research Laboratory, however, has developed a new technique that has already been successful in producing hybrid cells of soybean-barley, pea-carrot and rapeseed-soybean on an experimental scale. It is the stuff that science-fiction is made of. But then there is triticale, living proof that today's science-fiction might just become tomorrow's matter-of-fact. □

Dr Geoffrey Mathenge inoculates triticale seedlings with rust spores at the National Plant Breeding Station at Njoro, Kenya.



Seedling attacked by rust: survival of the fittest.



Photos: Neill Van Klee

IRISH POTATOES GETTING A WARM WELCOME

New lines of white potatoes that yield satisfactorily in lowland areas have been identified and tested in the Philippines by the Institute of Plant Breeding (IPB) of the University of the Philippines at Los Baños College of Agriculture.

The promising breeding materials of the heat-tolerant Irish potato were obtained by IPB from the Asian Vegetable Research and Development Centre in Taiwan. Tests carried out in farmers' fields have proved that the new lines can produce from 10 to 20 tons of tubers per hectare. Traditional varieties, which yield from 15 to 30 tons per hectare in highland areas, yield only half to three tons in the humid lowlands.

The new varieties will be propagated in the Highland Crops Research Station in Benguet, Philippines, and the breeding materials are being further tested in other parts of the country.

A crash program is also being launched by the vegetable group of IPB to develop a commercial lowland variety of Irish potato in two to three years. "With its high yield potential and wide acceptability among Filipinos, the crop will contribute much to food sufficiency," says Dr Laures T. Empig, head of the vegetable group.

INTRODUCING THE BURITI PALM ...AND OTHERS

What tropical plant produces tasty fruit rich in vitamin C, that yield an edible oil high in vitamin A, with kernels that also contain over 50 percent edible oil, and whose trunk produces a taro-like starch? It's the buriti palm, recently identified by an international panel of scientists as having considerable nutritive and economic potential for tropical areas.

Growing by the millions in South America, the buriti palm could also be a source of wine, timber, cork and industrial fibres. Its shoots can also be harvested to provide "hearts of palm" for the luxury food market. It is one of 36 plants

— cereals, edible roots and tubers, vegetables, oil seeds, forage crops and others — included in a report, *Underexploited Tropical Plants with Promising Economic Value*, recently published by the US National Academy of Sciences.

Some of the plants, like the buriti palm, have multiple properties. Others, such as the leguminous tamarugo tree, have potential for significantly improving conditions in arid regions. Native to Chile's forbidding Atacama Desert, the tamarugo grows through a layer of salt up to one metre thick. The nutritional quality of its leaves and pods allows sheep to be stocked at densities approaching those of the best forage areas in the world. Still others, like the jojoba bush, which produces a liquid wax comparable to the valuable sperm whale oil, have impressive industrial potential.

As the prospects of food shortages become more acute, research into these little known plants should become a priority, says the report. Today most people in the world are fed by only about 20 crops. "These plants," says the report, "are the main bulwark between mankind and starvation. It's a very small bastion."

Although minor plant species may possess equal merit to the world's staple food crops, they have generally been disregarded by researchers. As a first step to developing their potential the report recommends the preservation of germ plasm and the establishment of genetic resource stations. It also calls for international support for a system of horticultural facilities in tropical and subtropical countries to pursue agronomic research and extension.

The report is available from the Commission on International Relations (JH215), National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington D.C 20418, USA.

KENYA: VILLAGE TECHNOLOGY

Take a large sack, fill it with grass and leaves, plaster it with mud and cement, and in two or three days you have an urn that will hold about three times as much water as a 40-gallon steel drum and costs about one-third the price.

The urn, which can be made large enough to hold up to 1,000 gallons, is just one of a number of simple, inexpensive ideas being shown to Kenyan farmers at a Village Technology Demonstration Unit outside of Nairobi. Others include low-cost rodent-proof grain storage silos; a "refrigerator" that cools milk and food by evaporation of water dripping over charcoal; a cooking stove made from two 5-gallon cooking-oil cans; a windmill built of plumber's pipe and tin roofing material; and a simple vegetable drier made from wood frame and plastic sheeting.



Photo: E.H. Thomson UNICEF

A 700-gallon tank cost just \$8

The Demonstration Unit is part of the Karen Centre for Research and Training, and is sponsored jointly by UNICEF and the Kenya Ministry of Housing and Social Services. The emphasis is on the storage of water and food, and each day trainee instructors from Kenya's Village Polytechnic Program come to see the alternatives to commercially available equipment and learn how to make them.

In addition to the home-made products, the Unit has a collection of simple hand-operated water pumps and grain milling machines from all over the world. They are being tested to see which will work best in Kenya. The most suitable could be produced in Kenya at low cost, thus providing local employment and demonstrating the transfer of technology between developing countries.

Oscar Mann, a 28-year-old Kenyan who will be running the Unit for the next three years feels that appropriate technology's emphasis on need, simplicity and local materials makes it an important aspect of self-reliance. "I would like to un-magic technology," he says. "If only ten people get excited by these ideas then I'll be happy."

With the response the Unit has received in its first three months, Oscar should already be a very happy man.

THAILAND: VILLAGE HEALTH CARE

"It is generally accepted that a country can thrive only if the people are reasonably well in health and economy," says Dr Kawee Tungsubutra, Dean of the Faculty of Medicine of Thailand's Khon Kaen University. In rural Thailand, where close to 30 million people have little or no access to health services, the problems of health care are considerable.

In 1973 the Faculty of Medicine set out to improve this situation. As a first step the medical school's curriculum was revised in such a way that the newly graduated doctor could confidently take charge of a rural clinic. While in medical school his summers would be spent in the villages, advising the communities on personal and environmental health and sanitation, thus integrating him into the community from the beginning of his professional preparation.

In 1975 the Faculty staff in cooperation with the Ministry of Health and the IDRC, tackled the problem of improving distribution of health services in rural areas through a program to train 500 unpaid village health volunteers. The volunteers' training was based on responses to a survey of village leaders. High on their list of priorities were the recognition and prevention of parasitic diseases, the treatment of malaria and other common diseases, first aid, lifesaving techniques and nutrition. The villagers would also be trained in normal child birth methods, family planning and patient referral.

The first group of 50 volunteers, along with an equivalent number of government health officers with whom they would be working, attended the first two-week course in 1975; the second group early in 1976. Follow-up in the villages and further two-week sessions at the university every six months will complete their training. Continuous evaluation and supervision of the volunteer health workers is assured by the health officers.

Dr Kawee believes that the goal of good health will be achieved only through community participation, and that the Faculty's integrated program should help reach this objective.

Will it work, will it last, can I afford it?

David Henry

The problem of providing a reliable year-round supply of safe water to rural populations is one which today directly affects one billion people. Discovering possible solutions will be a complex process, since the situation varies dramatically, not only among countries, but from region to region within countries. However, one part of the water equation that is common to all developing countries is technology.



The best place to get a “fix” on the nature of the problem and the limits to present technologies is at the village level. Villagers may have to spend up to half a day carrying drinking water from the nearest source. It’s likely unsafe, but at least they have access to water of some kind. When we talk about rural water programs, we are talking about the delivery of safe water for 365 days a year.

In defining research priorities for rural water supply the successes and failures of some of the major interventions that have been made in the rural water field during the last ten years must be analyzed. The objective of most of the interventions was to supply reliable safe water to rural populations living in drought prone areas, where access to water was very difficult. During extreme droughts the traditional sources, hand-dug wells, rivers and ponds dried up, and the solution to the problem was beyond the economic and technological resources of the community itself. This situation prompted governments and international and bilateral donors to implement and assist large scale rural drinking water programs.

A brief look at the experience of last decade with the larger rural water programs, reveals a situation that is less than inspiring. In one Asian country, for example, where about 50,000 village wells have been drilled in hard rock, drought-prone regions, an estimated 80 percent of the wells are no longer producing any water. These 50,000 wells represent an investment at \$40 million, and are intended to serve a population of 35 to 40 million people. In West and East Africa the same story repeats itself, with failure rates of up to 90 percent reported by some countries.

What is wrong? If you ask a villager, he will likely show you a rusty piece of machinery, sitting on top of a pipe in the ground. The machine was designed over 100 years ago and except for some minor modifications has not changed much since. It is called a hand pump. The villager does not think it is a very good piece of machinery — and he is right.

The problems in rural water programs are not solely technological. There are also significant managerial, financial and sociological dimensions to the situation. However, until there is some improvement in the technology, the other three dimensions will be very difficult to deal with. At the present time we are confronted with a situation that is analogous to designing a public transit system, where the choice of technology is limited to 1920 Ford Model T’s.

For the sake of this discussion, let us assume the most feasible technical and economic solution to the water problems of rural populations will be to tap underground water, usually by drilling. Few of these villages will have access to electricity. The experience with diesel and petrol powered village pumps has not been good in most developing countries. It is difficult and sometimes impossible for the villagers to meet the operating and maintenance costs, and if something breaks down they usually find themselves far removed from the service and spare parts supply line.

The universal, and most reliable source of power for extracting drinking water from the ground in rural areas is still people. The question is, is it possible to develop a hand pump, that is reliable, and can be manufactured at a price villagers (individually or as a community) can afford?

Most research that has been done to-date in this area has generally lacked a sound scientific and engineering base and has had very little input from social scientists. For example, a large American research group was commissioned by a bilateral donor to produce an improved design for the conventional hand pump. The design was produced and tested under laboratory conditions. The testing consisted of operating the hand pump for one million strokes under laboratory conditions. Subsequently someone else doing some research at village level discovered that a hand pump under typical village conditions was subjected to between 5 and 9 million strokes per year. This reveals a rather striking gap in the research methodology. The pump referred to here has not solved any village water technology problems!



NO SINGLE SOLUTION TO AFRICA'S WATER PROBLEM

In its upper reaches, the Thika River seems an insignificant stream as it tumbles down out of the Aberdare mountains of Kenya into the Kikuyu district of Muranga. But it is no longer insignificant to the 140,000 people of the Kandara division, for, in a well-organized "harambee" (self-help) project, it has been turned during the last three years into the source of drinkable water delivered right to the door of every person in the area.

This point about home delivery is very important in the eyes of George Mwigigi, Kenya's Assistant Minister of Agriculture, who is also MP for Kandara. Before the pipes were laid, he explains, women used to have to spend at least three hours every day clambering up the steep slopes from the river carrying four-gallon drums of water on their backs.

By 1970 the people were fed up with this situation. Mwigigi says he found 22 different committees making separate plans for local communities, not to mention the 38 coffee factories that were making their own arrangements too. He managed, after a lot of talk, to get them all to combine on a single gravity scheme. By building a small dam up in the forest at 7,600 feet, enough water would be impounded for everyone in the area to have at least six gallons a day — on tap.

His biggest enemy was pessimism: "we can't do things on such a scale". But eventually all the groups were won over. Collection committees were set up in each community to raise 500 shillings (about \$60) from every family, and to arrange communal work-parties to dig the four-foot-deep trench in their stretch of the system.

Considering that the Kandara water scheme was built almost entirely by volunteer labour it is most impressive. Some funds for the scheme — for pipes and tanks — came from Canada and West Germany, and three German volunteers came as engineers. But the local people covered half the cost with cash contributions and labour. Certainly it would never have been done without thousands of men and women digging the trenches and building the break-pressure tanks.

But has it been at too high a cost? Capital cost works out at \$50 per person, and several visitors from other African countries have said they could not afford such an expenditure, and that in any case they are trying to bring potable water to rural communities with less density of population.

Where are the alternative models to be found? There is no single model, each rural area in Africa is liable to face its own set of problems in obtaining a steady supply of clean water and will have to devise its own solutions. The single common thread is a growing concern to provide access to good water supplies for entire populations. Tanzania has committed itself to doing this for all its people within 16 years.

A great effort is needed in many countries. Recent figures show that only six percent of Ethiopia's 25 million people have access to water that is fit for human consumption; in rural Nigeria only 10 percent.

Last year the IDRC sponsored two workshops of geographers, engineers and planners from a dozen African states to discuss the various problems of providing rural water supplies. The participants had many priorities. What are the best ways of involving local people? How can states in eastern Africa coordinate efforts to help nomads who continually cross national boundaries? Isn't it better and cheaper to adapt local technology rather than import foreign ideas?

Soon more research will begin on these and other questions. The building of a network among African states, so that they can share the experience and the lessons of this research, will be an important part of the endeavour. They can learn something from Kandara, and something else from the idea of using handpumps to make the *dambos* of central Malawi into safer sources of water. The important thing is to share ideas.

CLYDE SANGER

The observation of the director of one of the largest developing country scientific and industrial research organizations, that is conducting research in the rural water field, reveals an interesting new dimension. After reviewing developments in his organization, he commented that we should not overlook the potential contribution that industry, in both public and private sectors, can make to the solution of the rural water problem. At some point it will be necessary to apply manufacturing technology to the problem, and the sooner a dialogue is opened with the industrial sector the more likely it is that significant developments will be initiated in improving technology.

One of the other limitations to the water discussion thus far is that it has been confined mainly to public health engineers with a fairly strong urban bias. Other disciplines — particularly hydrogeologists, agricultural economists and engineers — could make a useful contribution. A recent review of ongoing irrigation research projects indicates that many of the approaches and research methodologies that are being applied to irrigation, could be applied to rural drinking water problems. After all, we are dealing with agricultural communities, and the technological, social and economic dimensions are basically the same.

Another very important aspect of the rural water scene is leadership. Water supply cuts across a very wide range of interests and disciplines. It will be necessary to identify people, who have a basic interest and understanding of rural communities, who can relate to a wide range of skills and organizational problems, and who can articulate this complex range of issues in terms that can be understood by political leaders, administrators, technicians and, most importantly, the villagers.

In order to improve the delivery of rural water and sanitation programs an effective system for exchanging information will be needed. Some of the best information on rural water and sanitation has never been published. This is probably because the people who are doing the work in the field are too busy to write, and the academics have not been very interested in rural water. The IDRC is now assisting in the development of an information system, and it is expected that in two or three years these major weaknesses in the information field will be overcome.

Efforts are underway to identify groups of researchers in Africa, Asia, and Latin America to undertake research in the field of rural water and sanitation and it is likely that within the next 12 months a few research projects on a modest scale will be initiated. In the development and implementation of these projects, two crucial points will be carefully examined: firstly that unscientific tinkering with technology is not clothed in research jargon, and secondly that a rigorous examination of the economic implications must be made to ensure that the villager is not priced out of the water and sanitation technology market place.

In the final analysis, the dictum of the villager will prevail: Will it work, will it last, and can I afford it? □

David Henry is assistant director of the Centre's Population and Health Sciences Division.

Getting down to the roots

Stella Feferbaum

When the talk turns to food production most people tend to think of the major cereal grains such as wheat, rice and sorghum. Root crops, although they are a staple part of the diet of many of the world's peoples, have been largely ignored until recently, especially by the scientific research community.

The growing threat of serious worldwide food shortages, however, has generated a new interest in all potential food sources over the past few years, and root crops are no exception. Just how much things have changed was demonstrated in August when 170 scientists, students and government officials from 42 countries assembled at CIAT (the International Centre for Tropical Agriculture) in Colombia, for the Fourth International Symposium on Tropical Root Crops. It was an appropriate location — two of the major root crops, cassava and potatoes, were first put to domestic use here in South America, and CIAT is a world leader in cassava research.

The symposium was organized by the International Society for Tropical Root Crops, and sponsored by CIAT, the IDRC and the US Agency for International Development. Participants had the opportunity to hear more than 50 papers presented by scientists from all over the world, and dealing with topics as varied as the history of root crops and the use of cassava foliage as chicken feed.

Nor were the scientists concerned only with the more common root crops. Any crop which offers potential as food is carefully investigated today, reported the society's new president, Dr Donald

Plucknett of the United States. By way of an example he described the enormous potential and methods of production of *Cyrtosperma chamissonis* — a lily-like plant with a starchy root that is common in the South Pacific, but was only recently "discovered" by researchers.

A particularly encouraging sign was the large number of young people, especially young women, at the symposium. In his opening presentation on the evolution of cultivation of tropical roots, Dr Jorge Leon of Costa Rica spoke of women's role in the transition from collection to cultivation as part of "one of the most important processes in history."

Today's women, or at least those represented at the symposium, are still pioneers, although their approach is now much more scientific. From the Malaysian Agricultural Research and Development Institute came Swee Lan Geh, a plant pathologist, and Swee Lian Tan, a plant physiologist. Both graduated from the University of Malaya and are currently receiving training at CIAT on work with cassava. Swee Lan reports that in Malaysia cassava is used mainly for industrial purposes, and not for human consumption. However, it is now being developed as animal feed in a project that is also directed by a woman.

From Brazil was Wania Freire Gonçalves, an agronomist in the plant-improvement program for cassava at the Brazilian Institute of Agricultural and Livestock Research. She too has been studying at CIAT, but will shortly be returning to Brazil, which, as one of the

world's leading cassava producers, is making enormous efforts to improve the crop.

From Jamaica, agronomist Cynthia Weir is currently working with cassava, sweet potato and yam at the University of Guelph as part of a cooperative program involving the IDRC, the University of the West Indies and the Jamaican Ministry of Agriculture. Cassava, she says, is grown only by small farmers in Jamaica, and yields are low. By increasing cassava production and substituting cassava flour for wheat flour, the country could reduce expensive imports.

One of the most attentive listeners at the symposium was Endy Pais, of Papua New Guinea, who at 22 was also one of the youngest delegates present. He recently graduated with the first class of agronomists from the University of Papua New Guinea, and is one of only 10 native agronomists in the newly-independent island nation. Seventy percent of the country's people live in the rural areas, and it is here that he has been working for the past year. Pais's main interest is the sweet potato, which is a staple food in Papua New Guinea.

Another former student of CIAT's cassava program, Dr A.G. Ngongi, of Ghana, presented a paper on the effects of potassium on cassava. He is currently working with his country's Institute for Soil Research on a project studying soil fertility, multiple cropping and factors limiting the production of food. With one of the lowest percentages of rural population in Africa, Ghana has recently started a "feed yourself" program, with the emphasis on the increased use of local resources.

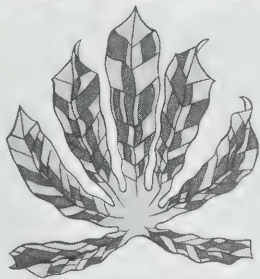
Potatoes, the Andean crop *par excellence*, also came in for a good deal of discussion at the symposium. Humberto Mendoza, of the International Potato Center in Peru, spoke on the adaptation of potatoes to humid tropical zones and the promising research the Center has carried out in this field. Recently 11 Southeast Asian countries, meeting at a seminar in South Korea, expressed considerable interest and requested information on the possibility of cultivating potatoes, he said, and similar interest has been expressed by some Central American countries.

The proceedings of the symposium, including all of the papers presented, summaries of discussions and a list of the participants, will be published early in 1977 by the IDRC. Copies will be available through the Centre's Publications Division. □



Attentive participants during symposium session.

African Cassava MOSAIC



Report of an Interdisciplinary Workshop held at Muguga, Kenya, 19-22 February, 1976
(Editor Barry L. Nestel)
Co-sponsored by the East African Agriculture and Forestry Research Organization
and the International Development Research Institute

African Cassava Mosaic, Barry L. Nestel, editor. Published October 1976, 48 pages, IDRC-071e.

This, the tenth in a series of IDRC publications on cassava research, is a report on an interdisciplinary workshop held at Muguga, Kenya, in February 1976. The meeting was jointly sponsored by the IDRC and the East African Agriculture and Forestry Research Organization, with the objective of reviewing the present state of knowledge and the current status of research relating specifically to African cassava mosaic, and identifying future research priorities in this field.

Approaches and Priorities in Rural Research in India, by V.S. Vyas. Published December 1976, 12 pages, IDRC-TS4e.

Originally published in mimeograph form by the Indian Institute of Management, this is a paper on the factors to consider in conducting social surveys in rural India. Dealing with such topics as survey technique, data collection, questionnaire format, and the limitations and applications of village studies, the paper draws on the author's own extensive experience in conducting surveys for the Indian government's Agro-Economic Research Centres.

Training and utilization of village health workers, Alexandre Dorozynski, editor. Published November 1976, 48 pages, IDRC-047e.

This is a report on a workshop held at Shiraz, Iran, in March 1976. Some 20 participants from Afghanistan, Iran, Indonesia, Nepal, Papua New Guinea, Philippines and Thailand compared their experiences, problems and approaches in the delivery of primary health care to rural peoples. The report includes summaries of the papers presented by the participants, and a precis of the open forum discussions that took place during the six-day workshop.

Natural Durability and Preservation of One Hundred Tropical African Woods

IDRC-017e

Yves Fortin and Jean Poliquin



Devindex Canada 1975, Gisèle Morin Labatut, compiler. Published December 1976, IDRC-079e,f.

The feasibility of establishing a computerized international information service for development policymakers and planners has been under study for a number of years sponsored by six international organizations, including the IDRC. The project is called DEVSIS (Development Sciences Information System) and as part of the feasibility study the Centre undertook in January 1975 to collect material in Canada on the economic and social aspects of development to provide practical experience of DEVSIS operation at the national level. This first bibliography, while not exhaustive, does represent the kind of information available in Canada that meets the criteria proposed for DEVSIS. In a fully operational computerized system the service would be issued monthly, making a large amount of current information immediately available around the world.

Science and technology policy implementation in less-developed countries: methodological guidelines for the STPI project, by Francisco Sagasti and Alberto Araoz. Published October 1976, 78 pages, IDRC-067e.

The Science and Technology Policy Instruments project is one of the most ambitious collaborative research projects of its kind yet undertaken, both in terms of the scope of its objectives and the scale of participation — 10 countries from Latin America, the Middle East, southern Europe and Asia. The leaders of the country teams met to decide on common themes, and asked the authors to prepare a set of guidelines for a research methodology that would provide a detailed framework on which to base their individual efforts. The end result was a publication that provides many useful insights which may be useful for a far wider audience of researchers than just the teams themselves.

Natural Durability and Preservation of One Hundred Tropical African Woods, by Yves Fortin and Jean Poliquin. Published October 1976, 131 pages, IDRC-017e.

Originally published in French in 1974 (IDRC-017f), this is a compilation of the currently available technical information, both published and unpublished, that was previously obtainable only from a great number of sources scattered around the world. The data have been interpreted and are presented in the form of tables for easy comparison. The report also includes conclusions by the authors, and sections on preservative treatments, scientific and common names of species, and a bibliographic list of references.

For details of how to obtain copies of these or other IDRC publications, see advertisement on the back cover of this issue.



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Cover photo by Neill McKee: illegal squatter settlement in Mexico City known as Ciudad Perdida — the Lost City. See article on facing page.

- 3 **Cooperation, not conflict**
The sites and services approach brings new hope to the urban poor, reports A.A. Laquian.
- 6 **Operation: research**
Seeking solutions to health care delivery problems in Africa, by Michelle Hibler.
- 7 **Bighead soup for lunch?**
Report on a Centre-supported aquaculture project in Malaysia.
- 8 **Wood: the neglected resource**
The Andean Pact nations join forces to develop their vast timber resources. Report by Susana Amaya.
- 10 **In agriculture learn from Tachai**
Clyde Sanger reports on China's efforts to mechanize its farms.
- 12 **Dossier: Population**
Last year the world's population passed the four billion mark — yet one recent report says the global growth rate is declining. In this *IDRC Reports* special feature five writers examine this and other aspects of the changing population equation.
- 18 **Commentary**
Satellites — are they rich men's toys or tools for development, asks Ernest Corea.
- 20 **Tropical diseases, the enemy within**
Alexander Dorozynski reports on the progress of a new international effort to combat major tropical diseases.
- 23 **Briefs**
People, projects, events.
- 24 **Food priorities in the Third World**
Jean Steckle examines women's role in developing new food processing and marketing techniques.
- 26 **Stretching the filmmaker**
Report on the making of a documentary film about the work of the Centre.
- 27 **New publications**

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Slum and squatter areas have been symbols of the urban problem in developing countries for decades. The dilapidated shanties and inadequate services reflect the inability of urban authorities to cope with city problems. Squatters and slum dwellers, being mainly migrants from the countryside, are evidence of the lack of opportunities in rural areas. The unplanned and uncontrolled growth of slum and squatter communities also shows the paucity of technical and planning solutions to the problems created by rapid urbanization.

The popularization in the 1970s of the sites and services approach has increased the hope that the solution to the slum and squatter problem is at hand. This new mood arose when the World Bank committed vast resources to sites and services. Starting with an International Development Association (IDA) credit of \$8.3 million to Senegal, the bank's involvement has rapidly increased to \$121.3 million in nine countries. At present, projects are being appraised in Kenya, the Philippines, Brazil, Colombia, the Ivory Coast, Morocco, Iran, and Thailand for an estimated \$150 million in additional loans and credits.

There are numerous variations of the sites and services approach, but the World Bank broadly divides projects into "sites and services lots" and "squatter upgrading." The term "sites and services" implies the opening up of new tracts of urbanized land that are provided with such services as potable water, sewerage, roads and drainage, electricity, and, sometimes, dwellings. Squatter upgrading, on the other hand, provides for services where the slums and squatter areas are, usually with the participation of the people themselves.

Even before the World Bank decided to go into sites and services, similar projects had been started in many developing countries. In fact, a survey of sites and services schemes in 1974 identified 80 proposed and completed schemes in 27 countries. This survey, however, did not include efforts that involved the illegal activities of squatters and slum dwellers themselves, who, faced with governmental apathy or opposition, decided to take matters into their own hands and invade sites and provide urban services for their communities.

Public programs for squatters and slum dwellers have been mainly reactions to popular pressures. By the mid-1960s, many governments were adopting an "if you can't lick them join them" attitude. Under the guise of such policies as self-help, aided self-help, core housing, roof loan schemes, social animation, and others, governments made it legitimate for squatters and slum dwellers to provide themselves with shelter.

Although the World Bank organized the IDA in 1960 to provide more flexible

Cooperation - not conflict

A. A. Laquian



Homes under construction at Das Marinas resettlement scheme near Manila. Sanitation services are already provided.

credits (including housing credits), no housing loans as such were given by the Bank for some time because housing did not enjoy high economic priority. With pressures from developing countries, the Bank started to provide housing as part of "productive" investments — for example, when workers' housing was made part of a loan for an industrial plant. The basic philosophy of the Bank was to invest in basic utilities and industries that would build economies, and these economies would, in turn, generate enough growth for housing to thrive as an industry. This viewpoint persisted within the Bank for a long time, and still exists in some Bank quarters. This bias against housing, in fact, makes the venture into sites and services most dramatic. To some people, the shift in philosophy proves that "the Bank has a heart". To others, it means that the Bank has surrendered to political pressures. Whatever the reason or the interpretation, the venture of the World Bank into sites and services has

made the approach most acceptable as a solution to the housing problems of developing countries.

In many articles, books, and pictorials on slums and squatters, a number of assumptions and generalizations have been popularized. Among the most important of these are that squatters and slum dwellers have the resources, skills, and motivations to provide adequate shelter for themselves. When given security of tenure and other assurances and resources, they build their own homes and improve them as their life situation improves. They develop their own market mechanisms to avail themselves of materials needed for shelter. They have valid reasons for choosing locations of their communities and are, therefore, their own best planners.

Because of these characteristics, squatters and slum dwellers were seen as "a solution and not a problem", people living in slums of hope rather than in slums of despair, disadvantaged citizens being denied the opportunity to improve themselves by an insensitive Establishment and a crassly materialistic economic system. The result is the realization that, if we are to cope with

the problems of shelter for the urban poor, the polar differences between squatters and slum dwellers on the one hand and the government on the other must be narrowed. Cooperation rather than conflict is necessary to improve the urban conditions. This realization lies at the root of what has happened to sites and services in the past decade.

Intensive studies of slum and squatter communities revealed vigorous organizational capacity along with good construction and production skills, and strong community and personal motivations that could be translated into positive developmental programs. Actual experience with such efforts, however, has been sobering. To begin with, community efforts are effective when focused on activities that are short-run, emotionally charged, and constitute one-time do-or-die efforts. Examples would be invasions, where there is the presence of a common "enemy" (the government), the need to work fast (build an entire community overnight), and the thrill of danger (possible combat with the police or army). When community resources, skills, and motivations are required for long-range, routinized, and commonplace activities, however, they fall down. Unfortunately, most activities in formulating, implementing, and evaluating housing programs fall into these types of activities.

In its first projects World Bank officials felt that economies of scale could be achieved if site preparation, construction of core houses (when part of the project), and administration of projects could be carried out by fulltime professional managers and workers rather than by popular effort. Economic rationality was used as a strong argument against communal efforts, self-help, and other "soft" approaches that sometimes proved unpredictable and unreliable. Heavy initial costs were encountered by resorting to machines, high-technology approaches, and work by contract. A number of countries objected to these approaches, mainly because of pressures from local people who needed jobs, and the squatters and slum dwellers themselves, who became fearful that such approaches were alienating them from their homes and communities.

At present, planners and administrators charged with sites and services projects rarely rely on community resources and skills in the early stages of construction in a project. After sites are prepared and services are installed, however, a great deal of reliance is placed on popular resources and skills. Almost all sites and services projects, for example, have incomplete houses, because the planners hope that homeowners will improve their houses later. In an El Salvador project supported by the World Bank people are given six options, ranging from a "core house" with roof, posts, and sanitary facilities to an almost complete house

that a family can occupy immediately.

Community resources and mutual help are difficult to fit into water supply and sewerage systems that require a certain scale for effectiveness and efficiency. Efforts to find alternative water and sewerage systems using "low or intermediate technology" have not yielded satisfactory results. This fact is most important because water usually accounts for 20 to 30 percent of total on-site infrastructure costs per plot and sewerage accounts for 40 to 50 percent of the same costs. Although there are many interesting suggestions for sewer systems (such as aqua privy, septic tank, and methane gas converters), water-borne sewer systems are still widely used for sites and services projects.

Water consumption may be reduced as much as a third if communal standpipes, rather than single tap connections in each house, are provided. Savings may also be achieved if communal toilets rather than individual household types are used. However, in almost all countries, communal toilets give rise to problems. Maintenance and continuous operation become extremely difficult when reliance is placed on community efforts.

Thus, in a crucial area where community resources are needed to effect economies and efficiency, experience has shown that relatively expensive and large-scale efforts are needed. Because of the importance of sewer and water systems in both the low-income community and the total city system, considerably more research is needed to find out how alternative systems can be introduced to improve existing situations.



Highrise development hides shantytown on hillside in Caracas, Venezuela.

One theory about low-income housing that has been repeatedly tested is that when people are provided security of tenure and resources, they will improve their houses as their financial positions improve. Ironically, governments in some developing countries have resisted the lowering or abrogation of "minimum housing standards" which would make possible lower investments in the housing structure. Public housing authorities and political officials who like to boast about their achievements in housing find it hard to accept that, after investments of millions of dollars, all they can point to are unfinished dwellings, ramshackle shacks constructed of salvaged materials, and "just another slum area," albeit a "planned slum." Philosophical arguments about transitional development are difficult to sell to a housing minister who is running for re-election and has to point to something dramatic (such as a high-rise tenement or multicoloured clustered homes) to fire the imagination of voters. Many governments, also, have zoning codes and municipal regulations on minimum housing standards, and lawmakers and administrators find it difficult to admit that they will be party to the violation of such statutes. Squatters and slums exist, but at least they are illegal. To legalize structures violating housing standards is something else again.

To enable homeowners to improve their dwellings, most sites and services projects provide building material loans. Generally, such loans are repayable over long periods (25 years) at relatively low interest rates (seven percent). Although these terms seem easy enough to middle-class families, they have been criticized by some as exploitative and regressive. The main argument used is that at very low levels of income, the necessity of paying for something on a regular basis, no matter how minimal, is a heavy financial and psychological burden. Most poor people resort to squatting or slum-dwelling precisely because their incomes are uncertain. Long-term debts put them in a straitjacket, which curtails their ability to manage their finances flexibly and cope with the vagaries of urban living.

Critics of materials loans also argue that, while it is true that buying and selling in bulk achieves economies of scale, such economies are also reduced by high administrative costs. Furthermore, certain materials may not be available in regular market channels. For example, used galvanized iron sheets, old oil drums that can be flattened out, discarded wood from crates, and cardboard are not provided in any materials loan schemes. These materials, however, are often used in housing, especially in the early stages of construction. Small scale trading, in fact, goes hand in hand with low cost housing. Because of the need to standardize and regulate materials, however,

such trading is often excluded in sites and services projects, thus denying communities of the urban poor not only a handy supply source but an income source as well.

The sorriest record of sites and services projects is found in the failure to appreciate the importance of location in relation to home, jobs, and transportation. Early sites and services efforts stressed the opening up of new lands by extending services. Most projects, therefore, were located in urban peripheries, required relocation of inner city squatters and slum dwellers to such sites, and resulted in economic, social and personal dislocations.

These early mistakes came about because of economic reasoning that focused on the project rather than on the development of the whole city or metropolitan area. Political expediency also influenced decisions about location. Often, the main reason for choosing sites was the availability of publicly owned land. The need to eradicate squatters from inner city land needed for other projects has also resulted in hasty squatter eviction and their relocation to unsuitable peripheral sites. Experience with these projects showed high rates of abandonment (as many as 80 percent of the families in a Philippine relocation site returned to metropolitan Manila barely two years after relocation). Sometimes, force had to be used to evict the squatters and relocate them. Already overloaded transport systems proved inadequate to provide services to peripheral urban areas. Job opportunities and service facilities that were expected to move to sites and services projects after the relocation of people there have failed to materialize.

Recognition of the complex relationships that link homes, jobs and transportation lies behind the increase of "squatter upgrading" programs that frequently complement sites and services projects at present. In the past, extension of public services to slum and squatter areas was avoided by governments because it amounted to recognition of the squatters' rights and legitimization of their tenure. At present, many governments recognize that provision of such services often produces benefits that far exceed those achieved in sites and services. The most important plus factor in squatter upgrading, however, is often the positive attitude of people themselves. Because their lives are not thrown out of whack by governmental programs, the people are generally supportive and offer help instead of resistance to the authorities.

After a couple of decades of experience with sites and services, some trends have become apparent. To begin with, the sites and services approach will most likely spread to other developing countries. The pressures for shelter in urban areas continue to mount as rural-urban migration and rapid population increases contribute to accelerated



Improved walkways and drainage system in a Kampung improvement project, Jakarta, Indonesia.

growth of cities. The World Bank's involvement in sites and services will almost certainly increase. At present, a careful evaluation of sites and services projects is being carried out by the World Bank, in collaboration with the IDRC and researchers from Senegal, Zambia, and El Salvador. This evaluation is aimed at finding out not only whether sites and services in these countries is accomplishing its objectives, but whether the impact of sites and services on the people and communities influenced by it is positive or negative.

Regarding the nature of sites and services projects themselves, the future will most likely witness the following trends.

Projects will combine more options than just sites and services and squatter upgrading. The history of sites and services shows the wisdom of a learning strategy where past successes and mistakes are fed back into present and future programs. Already, the Pikine project in Senegal is very different from the Santa Ana project in El Salvador. Both will be different, still, from the Tondo project in Manila or the kampung improvement scheme in Jakarta. As specific political and social conditions are encountered in client countries, sites and services will evolve in accordance with such changing conditions.

Projects will cater to varying types of populations. The choice of lower-middle income people for sites and services has been dictated by the conflicting goals of serving the needy while, at the same time, recouping investments. With more sites and services projects, subsidies will become more and more acceptable and projects will gradually include the lowest income groups.

Sites and services projects will most likely become smaller and less visible, consisting of interlinked projects within an urban area rather than large easily identifiable complexes. Planners of sites and services projects have been criticized for setting up "planned slums" and encampments for the poor.

The high visibility of such projects has made them the centre of political controversy. Since making the projects work is hard enough, without the problems that controversy brings, planners are now thinking of designing sites and services projects so that they are more natural and blend more with the total urban environment. They will become more integrated with metropolitan or regionwide development plans. The trend, at present, is to link sites and services projects with other land uses and activities throughout the whole urban landscape. The linkages between home, job, entertainment, and service needs, mediated by the transport system, are proving crucial to the success or failure of sites and services projects. Perhaps it is in this integration with the urban environment that sites and services will eventually realize its potential.

There is also a trend to use the approach as one of the key elements in a national human settlements strategy. Most sites and services projects in the past have been concentrated in large cities where the slum and squatter problem has been most acute. Lately, however, countries are requesting projects for intermediate and smaller cities. The motive behind introducing sites and services among cities in a country's urban hierarchy is rooted in the hope that such schemes may help to encourage people to stay where they are, instead of moving to the largest cities. There is precious little proof that such a strategy will work, since economic rather than service considerations seem to be given more weight in migration decisions. However, here, as in other previous elements in sites and services, experimentation seems to be warranted. It is in this learning-by-doing approach, after all, that the sites and services concept had made its contribution to the theory and practice of urban and regional development.

Possibly the most important change brought about by the sites and services approach is the fact that "hard currencies," such as loans from the World Bank, are now being devoted to housing. While the debates on whether housing is a productive investment or a welfare and consumption expenditure are still raging, enough policy-makers in developing countries are becoming convinced that housing is important, and they are devoting resources to sites and services and similar schemes to alleviate the shelter problems of the urban poor.

□

A. A. Laquian is Associate Director of the IDRC's Social Sciences and Human Resources Division. This article is an abridged version of a paper originally published in Science Vol. 192, pp. 950-955, June 1976. Copyright June 1976 by the American Association for the Advancement of Science.

Assume that you are responsible for providing health care services to 10,000 people living in a region devoid of health services. The budget for training personnel is 40 million francs CFA. To train a doctor costs 20 million francs; to train a health auxiliary costs one million. Do you choose to train two doctors or 40 auxiliaries?

This problem is more than a simple mathematical puzzle: in many developing countries situations such as this one are only too real and pressing. How best to solve it and similar problems in the health field?

This is what a group of 17 health professionals from various disciplines attempted to resolve at a seminar-workshop held in December 1976 under the auspices of the Centre universitaire des sciences de la santé (CUSS) in Yaounde, Cameroon. Here they familiarized themselves with operational/applied research and its applications to health research and policy.

Operational/applied research is a logical problem solving technique that uses scientific methods to study complex problems present in a system having definite goals, yet facing human, technical or economic constraints. It also goes beyond the initial formulation of the problem to take into account the unobvious factors that significantly affect it.

In our puzzle, the goals and constraints are obvious. But, to solve it, you must take into account such factors as doctor-patient ratio, the time the doctor can allocate to each, considering the distances he must travel and the available means of transport. Other factors must also be considered: the most prevalent diseases, the deaths they cause, the sanitary facilities in the region, and the overall health budget.

If, for example, it is found that most of the health problems are easy to identify (gastrointestinal disorders, respiratory ailments, infectious diseases), then you can define what type of personnel is required to treat them. It may be found that in 80 or 90 percent of the cases the health worker doesn't need seven years of post-secondary education to do this, but could, with a few weeks or months training, adequately serve most of the health needs of the region.

It is obvious that the approach to this problem must not only be systematic but also multidisciplinary since it reaches beyond actual health care to the area of health policy. Doctors, economists, administrators, nurses, engineers, statisticians, sociologists and so on must be involved.

The first step in operational/applied research is to identify the problem and then study the means available to solve it in order to choose the most appro-

Operation: research

Michelle Hibler

priate ones. While this technique has been widely used in industry since its inception during the second world war, it is still a newcomer to the health field.

In the industrialized countries, health care systems generally developed empirically. A number of non-industrialized countries followed their example and adopted the existing systems. Others, however, are aware of the problems inherent in these systems — uneven distribution of care, high costs, impersonal treatment — and are looking for alternatives. Operational research could assist them in their search for original solutions.

Cameroon, through CUSS, has emphasized training doctors, nurses and health technicians, prepared to serve as a team in rural communities. The program, still in its early stages, appears to have increased the delivery of health care services to rural areas although some problems still exist. In addition, CUSS has as one of its institutional objectives, the carrying out of research. For these reasons, CUSS and the Ministry of Health, with IDRC support, convened the workshop on operational/applied research.

Dr. T.C. Nchinda, professor of public health and general secretary of the Ad Hoc Commission of Operational Research at CUSS described the situation to the participants in these terms: "Imagine a research situation in which the problems are not clearly defined, the cause and effect relationships are uncertain and in which many of the variables cannot be quantified. Add to those communication barriers between the professional and the users, on the one hand, and between professionals of various disciplines, on the other. Fi-

nally, examine the political and institutional realities. The result is a situation similar to that in which we find ourselves today."

The first step to righting this situation is to define priority problems that must be studied and solved. The participants, divided into two groups, itemized 55 such problems in Cameroon. After much discussion, two were brought to the top of the list.

The groups' next task was to draw up an operational research proposal: to define the problem, examine the basic components, set the objectives, develop the methodology and indicate the steps and phases of this proposal, including the budget, required for its realization. The exercise included choosing research tools and means of evaluation, both essential components for the successful completion of the proposal.

Under the direction of Professor Dan N. Lantum coordinator of CUSS's public health unit, one group worked on the problem of training and utilizing nursing personnel and midwives graduating from ENISFAY, one of two national training schools. It had been noted that ENISFAY had fallen short of its targeted 5 000 graduates and that many hospitals were dissatisfied with the quality of nursing care provided. The nursing personnel was itself dissatisfied with working conditions and many had resigned during their first year at work.

It had also been realized that, in some instances in Cameroon, doctors were badly distributed and that some were underused. The second group tackled this problem by drawing up a research proposal for the evaluation of doctors' training and utilization in health services, a project not only important in Cameroon but also in many African countries considering or introducing programs similar to that offered at CUSS.

With the writing up of two detailed proposals, ready for submission to possible funding groups, the workshop had reached its objectives: to train a group of resource people in the area of operational/applied research who could be helpful when a government or institution faced a problem in the area of health. It also showed that a scientific approach to drawing up research proposals was not a luxury, nor was it necessarily complicated, and illustrated how a systematic approach could help orient future research and health policies.

This valuable exercise will undoubtedly be repeated at an international level in order to offer to health authorities the opportunity of systematically investigating certain health problems, and of then developing the type of intervention needed to solve them. □

An English translation of the proceedings of the Yaounde workshop is in preparation, and will be published by the IDRC in the near future.

Bighead soup for lunch

As marine capture fisheries are approaching their limit, the culture of fish in natural or man-made ponds is now assuming a more significant role in providing food for people. Freshwater fish production requires very little capital outlay, and, with proper techniques, can result in very high yields of edible protein per acre.

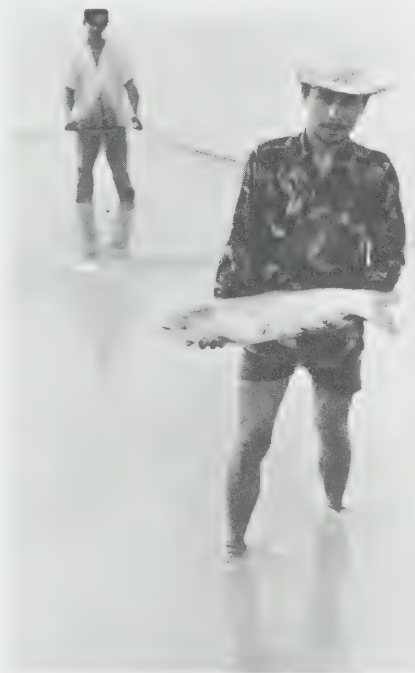
The Carps Malaysia Project was established as a result of the first seminar on aquaculture sponsored by the IDRC in Malacca, Malaysia, in April, 1973. That seminar identified a number of constraints on the increased production of fish seed: lack of trained personnel for research and extension in specific techniques, inadequately equipped research stations, marketing problems and lack of funds. These all appeared to be more or less common problems and demanded a coordinated effort among the countries of the region to help meet the enormous demand for protein in Southeast Asia.

The project in Malacca is being conducted by the Malaysian Agricultural Research and Development Institute (MARDI) at its Freshwater Fisheries Research Station — one of the larger and better equipped facilities of its kind in the region. It aims to provide the means of producing fish seed by induced breeding throughout the year, using pituitary hormone injections. Spawning, pond culture and feeding techniques will be standardized so that this knowledge can be extended to fish farmers throughout Malaysia and Southeast Asia.

In the initial stages the spawning work has utilized purified salmon gonadotrophin supplied by Canada, since a continuous supply of carp gonadotrophin is not available in Malaysia. Later, a local source of gonadotrophin such as tuna is to be purified by the project. Such a source is essential if Malaysia is to become self-sufficient in its fish seed supply.

The project is being assisted by two project advisors, one in endocrinology and the other in nutrition. Each works closely with a research officer counterpart, both of whom are to receive specialized training overseas. In all there are 11 people working directly on the project. In addition the research effort has been augmented by two consultants. Dr. H. Chaudhuri, head of

the Central Inland Fisheries Research Institute substation at Cuttack, India, visited the station early in 1975 and assisted the team in developing proper techniques in collection, handling and transportation of spawners. He also demonstrated breeding and hatching techniques, preparation of hormone



Below: netting carp at MARDI research station. Above: worker displays grass carp specimen.



extracts and pond-rearing of post-larvae. Another benefit of Dr. Chaudhuri's visit was to establish liaison between the project in Malaysia and India, with the aim of comparing results in similar fish species at different latitudes. Dr. H.S. Bayley, of Canada's Guelph University, also visited the project to advise the team on nutrition. He identified the major areas for the carp nutrition research and suggested future equipment, training and advisory needs.

The main thrust of the project is to concentrate on the difficult-to-spawn Chinese carps: the grass carp *Ctenopharyngodon idellus*, the bighead carp *Aristichthys nobilis* and the silver carp *Hypophthalmichthys molitrix*. Once techniques for spawning these fish have been worked out it is planned that standardized spawning procedures can be widely applied to popular fish such as *Puntius gonionotus* and *Leptobarbus hoevenii* which are becoming rarer in natural waters. All these have great potential for fish culture, since most of them are either herbivorous or plankton feeders, and thus are very economical fish to cultivate for human consumption.

The exotic carps spawn naturally in their native temperate zone habitats of China and the USSR. Spawning takes place in swiftly flowing rivers, although the grass carp has been found to spawn naturally in reservoirs in Taiwan, Japan and Mexico. Courtship and spawning are stimulated by rising water levels caused by heavy monsoon rains, and the lowering water temperatures. In Malacca there is no such distinct monsoon period or cooler waters, so the fish lack the environmental stimulus occurring in their natural habitat. Water temperatures remain high and relatively stable all year round. These tropical environmental constraints have made it difficult to spawn Chinese carps at Malacca in the past. The station is almost on the Equator.

So far the project has had limited success, however, in the induced

spawning of carps using salmon gonadotrophin. Thirty-three percent of the silver carp tested and 37.5 percent of the bighead carp tested have been induced to spawn. Grass carp, traditionally the most difficult of the Chinese carps to spawn in the tropics, have yet to be successfully spawned.

One of the difficulties experienced at the station so far has been the lack of adequate numbers of sexually "ripe" fish. It may be that the failure of the fish to spawn is due to this reason and not to potency of the hormone. Several new preparations of salmon gonadotrophin have been provided by B.C. Research of Canada, and comparative potency tests will be carried out using these extracts on the "Java" carp *Puntius gonionotus*.

One very positive result of the project has come from the nutrition experiments on the brood stock of the grass carp and bighead. It was found that when proper feeding techniques were applied — such as phosphates, Napier grass and rice bran — a very much improved gonadal development was achieved.

The nutrition team is also working on techniques for the production of live food for the carp fry. *Moina*, a small crustacean, is now being mass-produced using chicken dung as fertilizer. Bighead fry raised solely on *Moina* exhibit a survival rate of well over 90 percent. Formulating feeds from cheap, locally available materials is one of the primary objectives of the nutrition team.

As in most IDRC-supported projects, training is an important aspect of the carps project. Two of the Malaysian assistants have attended four-week courses on fish culture techniques in Indonesia. Another took a six week course on induced breeding and pond management at Cuttack, India, and the Malaysian nutritionist will study for an MSc. at Cornell University's Tunison Laboratory of Fish Nutrition. This should give MARDI the expertise to do very extensive long-term research on the nutritional requirements of any kind of fish.

Towards the conclusion of the project in 1977, the results will be discussed with representatives from other Southeast Asian countries at a seminar to be held in Malacca. A pilot hatchery, incorporating the principles developed in the project, will be constructed and used as a centre for training people in all aspects of spawning techniques.

It is anticipated that through this method MARDI can help to increase the fish seed supply for growing fish as human food in Malaysia and the region. Who knows, there may even be a market for bighead soup in Canada!

This article is based on a report compiled by the project staff — A. Tajuddin, E.G. Watts and J.D. Funk and program management staff W.H.L. Allsopp and F.B. Davy.

Wood - the neglected

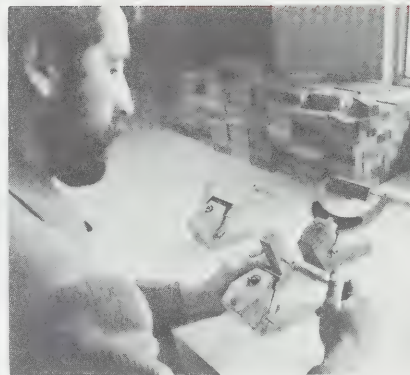
Wood, widely used as a construction material in many parts of the world, has been largely neglected in many Andean countries despite the vast timber resources available. Cultural rather than technological reasons are at the base of this neglect: Spanish tradition favours brick and concrete houses, and many people believe wood structures to be shorter lived and less secure. The fact that wood is extensively used in slum dwellings means that it is labelled a "poor man's material", and thus has inferior status.

The region's timber resources are considerable. In total, tropical forests cover some 220 million hectares of the countries of the Andean Pact Commission — Colombia, Venezuela, Ecuador, Peru and Bolivia — representing 60 percent of their combined land area.

Recent studies have indicated that less than 0.1 percent of these forest resources are currently being utilized and that 80 percent of the wood harvested is used for fuel. Of the estimated 2500 tree species growing in the region, only about 50 are now used commercially. Yet, as many as 400 of the most abundant species may have commercial value.

The building industry provides by far the most important market for timber products throughout the world. The only way to make a significant breakthrough in tropical timber utilization in the Andean region, therefore, is to penetrate this market. The greater utilization of the timber resources could also help to solve the region's acute housing shortage, making more low-cost houses available in both rural and urban regions.

In 1971, the Andean Pact Commission began a series of studies aimed at establishing a science and technology program that would stimulate economic and social development in its five member countries. One of these detailed studies was on the use of forest products and it highlighted the need for research into the technological properties of many lesser known species.



Researcher recording precision measurements of wood samples at the District University of Bogota.



Open-air drying tests of wood samples, also in Bogota.

Photos: Jaime Rojas

resource

Susana Amaya

Such a research program was launched in 1975 by the Andean Pact Commission in order to develop the technology of tropical timber, particularly for use as a structural material in wood construction. Luis Takahashi, Peruvian engineer in charge of design for the project, points out, however, that the aim of the project is not to substitute wood for concrete, the most widely used construction material in the region, or for other materials. "The housing deficit is so great that there is no way to do so... the idea is for timber to become a part of the package of materials used by the architect and the engineer," he says.

As a construction material wood does in fact offer many advantages. Readily available, easy to transport, light and easy to handle, it does not require sophisticated techniques for its assembly. Equipped with an axe and hammer, a farmer can build his own house using the surrounding trees. And because wood is a poor heat conductor, wood houses are cool, an important quality in hot, humid regions.

In earthquake-prone regions wood is more resistant to breakage than concrete. If damaged, wood structures can be quickly and cheaply repaired. Chile, for instance, has long used wood in construction because of its ability to resist stress during earthquakes.

Wood also requires less energy to be transformed from tree to lumber — as little as one-twelfth the energy required to transform iron into steel. And the development of a forestry industry would provide much needed employment opportunities outside the major cities.

A number of problems, however, hamper the development of the forestry industry in the region. The great variety of species has made large scale industrial exploitation difficult. Getting the timber out of the forest is often a perilous undertaking because of the steep topography of the area and the abundant rainfall.

The tropical rain forest also grows slowly: from two to three cubic metres

of wood per hectare annually. To avoid denuding the forest, longer felling cycles must be observed and careful planning and selection carried out. Yet, despite these hindrances, a case study has shown that one hectare could produce 90 cubic metres of potentially industrially usable timber.

By determining the industrially functional properties of different species and developing appropriate technologies, the Andean Pact study should help realize the forest's potential. To do so, the forestry technology project emphasizes the practical utilization of wood, based on the study of the physical, mechanical and other properties of 100 different timber species, 20 chosen for study by each of the five participating countries.

Among the properties being studied are the compression strength and the elasticity of different species. The wood's natural durability is being evaluated under field conditions and in laboratories and tests are done to find the most suitable means of preserving certain species against insects or fungi. Seasoning tests of hardwoods are conducted for both air-drying and kiln-drying. And the defect peculiarities of various species are also being noted in order to prepare proper stress grading standards for the timbers.

Since the technology normally used for connecting softwoods is not applicable to tropical hardwoods, the researchers are studying various types of joints that could be used for timber assemblies. The woodworking and machining properties of tropical woods are also being tested.

The project is being carried out through a network of universities and forestry laboratories in the five countries. Participating in this IDRC-supported project are: The Forestry Office Laboratory of the Ministry of Breeding and Agriculture and the Merida University in Venezuela; the Office for Forestry Development and the Central University in Quito, Ecuador; the National Agrarian University and the Forestry Office Laboratory

in Peru; the District University in Bogota and the National University, Medellin, Colombia; and San Andres University in La Paz, Bolivia.

Coordination of the country teams, classification of species by defects and structural and architectural design work are done at the Pact's headquarters in Lima, Peru.

As each country's knowledge and experience in this field varies, they are exchanging information and advice. Specialized, practical training in timber grading and timber design and in statistical techniques applied to timber technology are also being offered to research assistants.

The results of the studies will be compiled in manuals and technical guidebooks for use by lumber mills and builders for whom the new technology is designed. Specifications arrived at will also allow architects and engineers to use timber in construction with the same confidence with which they now use steel and concrete.

In a second stage, the project will focus on the design of model wood structures — domestic, industrial and farm constructions — suited to the needs and characteristics of different areas. At this stage, the researchers will have to deal with the deep-rooted cultural barriers to wood construction.

These activities are only a part of a wider program aimed at introducing and establishing a new technology in the region. Included in this program are the selection and dissemination of technical and scientific information, the mapping of forests by means of radar images and the establishment of a technical assistance service for forest industries in order to make the information available to users.

The project's organizers hope that in the long run, wood construction will become widely accepted in both rural and urban areas. But 400 years of tradition are not easily overcome. The success of this project rests ultimately in the hands of the governments and national interest groups concerned. □

In agriculture learn from Tachai

Clyde Sanger

One of the first questions you are expected to ask these days on a visit to a commune in China is, "How far has mechanization gone?"

The answer is on the tip of the tongue of any official giving the routine briefing. It flows smoothly off the lips of Ku Li-yung, vice-chairman of the revolutionary committee of Tao Pu Peoples Commune, whose 15,000 members make a good living growing vegetables for sale in nearby Shanghai, besides growing rice for themselves:

"In drainage and irrigation our target this year is to reach 100 percent. In harvesting we have reached 40 percent, transplanting 80 percent, trench-digging 60 percent. We've achieved our targets for ploughing, threshing and insecticides. Overall, we are 70 percent mechanized."

In other places the answer may not always be as detailed. In some places, like Linhsien County in Honan province which was transformed by a huge irrigation canal cut through the Taihang mountains, the recital ends with a near-apology — or at least modesty: "... 60 percent of the land is mechanically ploughed. That is not very much."

But everywhere there is acknowledgement that agricultural mechanization should be brought in as quickly as possible. It began with a new slogan from Chairman Mao: "The fundamental way out for agriculture lies in mechanization." Then the target was set of 1980 for the achievement of basic mechanization. (Cannily, the Chinese leaders inserted the blurring adjective "basic", probably to allow for a margin of failure).

A big push to mechanization — perhaps even the greatest momentum — was given in a speech by Hua Kuo-feng in October 1975, nearly a year before he succeeded Mao as Chairman.

It was a speech that helped Hua to the top; he was in the spotlight, summing up on a month-long National Conference on Learning from Tachai in Agriculture. And it was the speech of a no-nonsense manager, saying that some county officials were "soft, lax and lazy" and then going on to declare that it was at county level that the emphasis for leadership in agricultural development should be put. His speech was given the title: "Let the whole party mobilize for a vast effort to develop agriculture, and build Tachai-type counties throughout the country".

He was making a crucial point. The lower levels of organization — the production team, the brigade and the commune — would obviously retain importance. Indeed, Hua said the idea

of the team as the basic accounting unit was still right for most of China, although he expects a step-by-step transition to brigade or even commune level "when conditions are ripe". But to spearhead mechanization, and to promote capital construction, the county — with a population of between 200,000 and 800,000 — must take a leading role.

Hua even touched one level higher. Provinces, municipalities and autonomous regimes, he said, "must energetically develop their own farm machinery industry in the light of local conditions" to supply communes and brigades with equipment for the mechanization of agriculture. It was a strong directive to move away from backyard industries.

There is something of a paradox in talking about "Tachai-type" counties. Tachai itself is a production brigade of only 83 households, who have in their time resisted handing over control of some of their assets — for instance, the piggery — to the Tachai People's Commune. But ever since 1964, when Mao praised their heroism in overcoming floods that swept away their homes and in rebuilding their land in terraces and told the rest of China, "In agriculture learn from Tachai," this brigade has been a model for increasing productivity. In 1975 Hua Kuo-feng took this argument a step further by pointing out that the 200,000 people of Hsiyang County (which includes Tachai) had indeed learnt from its model, and if all the counties of Shansi province did as well as Hsiyang the amount of marketable grain there could increase fourfold.

So the pressure was on to bring other counties to the level of Hsiyang, or a Tachai-type, county. In 1975, by Hua's calculation, there were already 300 that qualified, and he set a target of 100 new Tachai-type counties a year for the next five years.

How do counties qualify? In a pyramid pattern, each county sends an examination unit into its communes to check on how well the individual brigades are doing. (In mid-November such a group from Hua Hsien county went checking on brigades in Hua Tung commune, near Canton, and judged that 10 out of 11 examined passed the test; subsequent pressures on the hapless 11th brigade can be imagined). Twice a year the 27 provinces are required to submit reports on all their counties to the Party Central Committee, including progress in farm mechanization.

The main reason for mechanization is to increase yields per hectare, rather than to increase the number of hectares cultivated. The Tachai brigade, for all its astonishing work in terracing the gullies and the ridges, has only added three hectares to the 53 already being farmed in 1945. But the yields per hectare in Tachai have trebled. Through levelling, they turned 4700 small plots into 1500 larger ones, and three-quarters of that land can now be tractor-ploughed. Millet was once the main crop, but now they grow mostly maize and sorghum — and can plant a crop of winter wheat in good time, even though there are only some 160 frost-free days.

An extra crop a year is seen as the

Hand operated sorghum thresher in action at Tachai: a model for increasing productivity.



Photos Clyde Sanger

first benefit of mechanization. In Linhsien County they used to grow only two crops, usually rice and winter wheat; now, they say, they fit in a third. In Tao Pu commune they grew, before mechanization, one rice and one wheat crop; now they can add a second rice crop. In their vegetable fields, they claim, they can grow more than seven consecutive crops in a year — an achievement also made possible, no doubt, by bringing them on a long way in nursery plots.

A very secondary benefit is the saving of labour to be redeployed in "sideline occupations"; but at Tao Pu they said that 1000 people now worked in the commune's industries, compared with only 200 in 1966.

Mechanization is being built around the 10 h.p. walking tractor. Although it is produced in workshops at county and even commune level, its specifications are said to be standard throughout China; certainly I saw similar models near the Ming tombs north of Peking and in Kwantung province far to the south. Its price is also set at a unified rate of 2300 yuan (\$1150). As useful on the roads as in the fields, these tractors are steadily taking over the heavy task of hauling produce to market that has been done by mule-carts or by girls, glistening with sweat, pushing hand-carts.

Their numbers are increasing impressively. The manager of the East is Red machinery plant in Linhsien said it turned out 300 in 1975, 1000 last year, and would produce 5000 this year. Chung-hua county, near Canton, already has 1400 walking tractors and another 100 medium-size (40 h.p.) ones. These figures compare with 1967, when Dick Wilson in his book *A Quarter of Mankind* reported there was an average of one tractor to every commune.

To the fore in mechanization as in other activities, the peasants of Tachai and Hsiyang county designed their own type of tractor for their special needs — one with a tight turning circle and caterpillar tracks for climbing slopes. The central government, which controls raw materials, approved its design and has authorized production of about 3000 of these special tractors a year, with nation-wide distribution.

You can see a wide range of farm machines — trench diggers, transplanter and all — being produced in commune and county plants. Some are of charmingly improvised design, like the transplanter at Tao Pu built on a sturdy bicycle wheel. How economic it is to produce such machines is hard for a visitor to judge, just as it seems to be pushing self-reliance to extremes to depend upon rather dilapidated fertiliser plants at county level. (The Chinese have acknowledged the latter in importing new fertiliser plants from Japan, France, Netherlands and the U.S.)



The 10 h.p. "walking tractor" — key to China's agricultural mechanization program.

The popularizing of a standard machine seems to be their answer. At the Shanghai industrial exhibition is a rice transplanter that can cover a hectare in five hours, 10 times as fast as hand transplanting. Its cost is about 1000 yuan.

The process of popularization has not always been even. In most parts of Kwantung province, for example, pedal threshers are a familiar machine. Its virtues are obvious: simplicity (just a drum with spikes poking out, rotated by a pedal bar), cheapness (once 130 yuan, it now costs 80) and effectiveness (it can fill a basket with rice in five minutes, can be pushed on runners across a field and carried on a pole between two people). Yet within a few kilometres of where a group of peasants said they had been using it for 10 years were other peasants still using hand-

threshing techniques, thumping rice down on a slatted table.

But probably the heavy emphasis that has been put by Chairman Hua and others on building Tachai-type counties and on farm mechanization will ensure that more modern methods now spread rapidly and evenly. And their concern to press this campaign can be seen in the fact that, although in 1975 Hua thought another Learning from Tachai conference should be held in five years' time, this follow-up conference was unexpectedly held in December. □

Clyde Sanger, associate director of the IDRC's Publications Division, recently returned from a visit to China during which he had the opportunity to take a first-hand look at agriculture in several parts of the country.

The pedal thresher: it can fill a basket with rice in five minutes.



Grounds for cautious optimism?

Ernest Corea

The survival of the human race may ultimately depend on our ability to control our numbers before we run out of space, food and other resources. During the past two decades more and more people have become increasingly aware that there are . . . more and more people, an awareness that has triggered a growing concern with population issues. The pessimists make dire predictions, and warn that spaceship earth may soon be too overloaded to continue to support its passengers and crew. Some even advocate a "lifeboat" policy, where the rich survive in their enclaves, leaving the poor to sink or swim unaided. The optimists, equally concerned, though not always in agreement, organize world conferences to hammer out acceptable programs and policies, watch uneasily for new demographic trends, and talk in terms of "family welfare planning" and "contraceptive technology" rather than birth control.

For more than mere semantics, the IDRC must be counted with the optimists. Two of its program divisions — Population and Health, and Social Sciences — are directly concerned with family planning and population research. Since its inception in 1971, the Centre has provided support for more than 50 projects in these two areas. In 1974 the Centre began its Southeast Asia Population Research Awards Program (SEAPRAP), which has already made research grants to more than 40 young Asian scientists in this field.

This past year the Centre's Board of Governors approved one of the largest projects yet undertaken — grants totalling some \$3 million to assist in a coordinated international effort, based in India, to develop new and better contraceptives. One of the most promising leads is a contraceptive vaccine that could also have applications in the fight against cancer.

The articles on the following six pages, then, are dedicated to the optimists. Not to the starry-eyed advocates of such schemes as mass interplanetary migration, but to those who have looked hard at the reality, and think they may have just glimpsed a point of light at the end of a long tunnel.

"Doomsday" was a buzzword popular among population watchers in the '60s. They warned anybody who cared to listen that a Malthusian nightmare was inevitable. Today, by contrast, in the second half of the '70s, there is optimism about how many — or how few — people will be around on planet earth of the future.

Herman Kahn has predicted that population growth rates will level off over the next 200 years. A current United Nations report on "The Future of the World Economy," says that "... growth of population is not an exponential process, or an exponential explosion, in which a constant growth rate is maintained."

Newspaper headlines reflect these hopes. "Biological time-bomb under control after all," "East Asia successfully curbs population growth," and "Population explosion now appears to be called off" are samples.

These changed expectations are based on reports that population growth rates have ebbed almost all across the world. Tragically, in some cases, the decline has been due to a rise in death rates. More propitiously, in other countries the drop was the result of carefully planned and resolutely applied population policies.

A comprehensive account of the new population trends, and what they imply, was prepared by Washington's Worldwatch Institute, "an independent non-profit research organization created to identify and to focus attention on global problems."

The Worldwatch Institute reported in October 1976 (Worldwatch Paper No. 8, *World Population: Signs of Hope, Signs of Stress*) that "sometime near the beginning of this decade, the rate of world population growth reached an all time high and then began to subside. At that point, the longstanding trend of accelerating population growth reversed itself. The world has passed the inflection point on the population curve."

The population growth rate of a country or region is the difference between its birth rate (number of births per thousand) and its death rate (deaths per thousand) expressed as a percentage. In the United States, for instance, the birth rate in 1975 was 14.8 per thousand, and the death rate 9 per thousand. The difference — 5.8 per thousand — worked out to a population growth rate of slightly over .5 percent.

In most parts of the world, the Worldwatch report said, population growth rates dropped between 1970 and 1975. In North America, the rate dropped from .9 percent in 1970 to .6 percent in 1975. The drop in Western Europe was from .56 percent to .32 percent; in East Asia from 1.85 percent to 1.18 percent, in Southeast Asia from 2.66 percent to 2.33 percent, in South Asia from 2.48 percent to 2.13 percent, in the Middle East from 2.88 percent to

2.72 percent, and in Latin America from 2.77 percent to 2.65 percent.

A contrary trend was noted in Eastern Europe where the population growth rate rose from .84 percent to .86 percent, and in Africa where the rise was from 2.61 percent to 2.71 percent.

Despite these deviations, the global trend was downwards. The overall world population growth rate, 1.9 percent when the decade opened, dropped to 1.64 percent in 1975. Thus, one year after the World Population Conference was held in Bucharest, the world had already improved on the target of a 1.7 percent growth rate that the conference set for 1985.

The world's population remained under four billion in the first half of this decade, rising from approximately 3.5 billion in 1970 to 3.9 billion in 1975. If this trend persists, it is possible that the Malthusian nightmare of eight billion of us scraping at the world's depleted resources by 2000 A.D. will not be experienced, after all.

Statistics are invariably controversial and, in some cases, unreliable. They can also be differently interpreted. Worldwatch figures are drawn mainly from census data provided to the UN by member-nations. A commentary in the *Financial Times* of London, England, has said that this "raw material" is "often a matter of taking the last known census and adding in some inspired guesswork." The US Office of Population interprets current figures to mean that "the world population total would be less than 5.5 billion by the year 2000." An executive of the UN Fund for Population Activities, using the same statistics, estimates that world population will be 6.25 billion by that date.

Reservations and controversy are useful correctives to the heady optimism usually evoked by any sign of improvement in the human condition. One should remember, however, that today's optimism is based on the same kind of data, from the same sources, that caused yesteryear's prophecies of doom. The improvement in the overall population situation might well be only a change from "bad" to "better," but that is a promising change nevertheless.

In the "developing" countries, the most dramatic drop in population growth rates of the '70s was in East Asia. China's record is the most remarkable. "The reduction in the Chinese birth rate from an estimated 32 to 19, or 2.6 points per year, is the most rapid ever recorded for a five-year span, besting the earlier reductions of nearly two points per year achieved by Taiwan, Tunisia, Barbados, Hong Kong, Singapore, Costa Rica, and Egypt," says the Worldwatch report.

There are obvious difficulties in counting heads in China where one-fifth of the world's people live. Not surprisingly, current estimates of China's population growth rate differ. The US Library of Congress puts it at 1.5

percent, Worldwatch at 1.1 percent, and the US Agency for International Development at 0.8 percent. Wherever the exact figure might lie, all available indications are that it is well below the 2.4 percent rate that a consensus of population studies established earlier in the '70s.

An assessment published last year by the International Planned Parenthood Federation suggests that China now has "the most effective and efficient large-scale and comprehensive population policy in the developing world." (For an account of "birth planning" policy and practices in China, see page 16).

Elsewhere, too, population policy is considered as crucial as, for instance, food production. Population policy consists of many strands, such as law, social reform, changes in the status of women, medical research, sociological research, communications programs, increased production and distribution of family planning devices, and so on. Indeed, despite the stereotype of the Third World's peoples as irresponsible, irrepressible multipliers of themselves, the fact is that many developing countries have, in recent years, displayed both a single-mindedness and a sense of innovation in their approach to population policy.

Singapore maintains an interlinked program of incentives and disincentives to promote family planning. Civil servants who are voluntarily sterilized are given seven days' leave with full pay. On the other hand, birth delivery charges in government hospitals are so graded that each additional child costs more. Some components of Singapore's population laws have been called "draconian," but they have been effective. Singapore has cut its population growth rate by half in 10 years. Two years ago the young city state achieved its objective of the two-child family as the national average. Dr. Margaret Loh, executive secretary of the Singapore Family Planning and Population Board, said in a recent press interview.

Pakistan, where Prime Minister Zulfikar Ali Bhutto said last year that population planning should be "given high-

est priority in the development initiative," has inaugurated a special system of old age welfare payments to parents, if either spouse is sterilized. **Egypt** increased social security and pension benefits, similarly, in 1974. Such measures reassure parents who look on children — particularly male children — as "insurance" for their old age.

South Korea gives preference for subsidized housing to a family whose "head" has undergone a vasectomy or sterilization.

The **Philippines** Labour Law allows paid maternity leave to a woman worker only up to her fourth delivery. In the same spirit, income tax deductions for children cease when a family has more than four. Tax laws have also been integrated with population policy in South Korea, where the number of "tax deductible" children is limited to three; and in **Indonesia**, where the number of dependents counted for tax deduction has been reduced from 10 to seven.

The Indian state of **Maharashtra** (population: 50.4 million) passed a compulsory sterilization law last July, making sterilization mandatory after the third child. The law has since been amended: a fourth child is now permitted, where all three children born before were of the same sex.

Throughout Asia, volunteer workers, traditional midwives and public health staff, carry the message and the mechanics of population planning deep into rural areas. A public health doctor has in **Sri Lanka** opened a pilot family planning clinic in a village temple, the fount of village wisdom and the centre of village life, with the support and co-operation of the resident monk. Both **India** and **Bangladesh** have married the age-old art form of puppetry with modern electronic technology to disseminate information about population. **Iran** operates a network of community welfare centres offering a variety of activities that range from literacy classes to family life education and family planning services.

Backing up these and other aspects of population policy in developing countries, are continuing research programs that are meant to make population planning scientific, safe, and non-traumatic, both socially and psychologically. The IDRC has supported several of these programs — all of them devised by developing country researchers in terms of their own national needs and aspirations. Over the long term, the results of these research programs may be the most useful of the various elements that constitute the current approach of developing countries to population policy. □

Former journalist Ernest Corea, from Sri Lanka, is associate director of the IDRC's Publications Division, responsible for the Centre's public information program.



Singapore: the two-child family is now the national norm.

Photo: Clyde Sanger

A challenge to research

David Spurgeon

Current contraceptive technology cannot be regarded as adequate to meet either individual or societal needs in either industrial or developing nations, and funding must be continued at a much higher level in order to improve it.

That is the conclusion of a study involving more than 160 experts in 26 nations that was initiated by the Ford Foundation, with the collaboration of the Rockefeller Foundation and the IDRC. The study has resulted in a report, *Reproduction and Human Welfare: A Challenge to Research*, (Roy O. Greep, Marjorie A. Koblinsky, and Frederick S. Jaffe, published by the MIT Press).

A decline in funding for contraceptive research led to the study: in the face of growing worldwide population problems, funding dropped after reaching a peak in 1974 of \$119 million, to less than \$109 million in 1976. The report concludes that at least three times the 1974 level (or about \$361 million) is needed to pursue research leads for new, effective, reversible, safe and inexpensive fertility control methods.

Those responsible for the study do not expect to find an ideal, all-purpose contraceptive suitable for every individual. The diversity of personal, cultural, religious and economic circumstances is too great – and in fact the needs of the individual vary at different stages of life.

"What is needed," says the book, "is a broad array of contraceptive methods that require less complex distribution systems, that are safer, less discomfiting, and more convenient than current methods, that combine high acceptability with high continuity of use, and that are suited to the diverse requirements of the world."

In discussing the book (which he says gathers and orders "what we know and do not know about the reproductive process"), McGeorge Bundy, president of the Ford Foundation, told a press conference that while "some of us may have become rather inured to cries of alarm about the 'population explosion' . . . the fact remains that the growth of human population in the developing world continues at unprecedented levels.

"While fertility has begun to fall in six of the eight largest developing countries, so has mortality, and the next quarter century is expected to witness a continuation of the very high rate of population growth – about 2.3 percent per annum – experienced in the last 25 years."

Whether population grows exponentially in the 21st Century, or whether as projected by the United Nations, the rate of growth starts decreasing, to stabilize sometime after 2075, the consequences for human welfare are deeply disturbing, McBundy said. Illiteracy will increase as the number of children surpasses the expansion of school facilities, unemployment will increase, income will be even more unevenly distributed, and the population will be fed only if large areas of currently unexploited land are brought under cultivation.

But population problems are not confined to the developing world, said Bundy. "While population growth in the United States has ceased to be a problem that alarms us at the moment, the epidemic of unplanned, illegitimate adolescent

pregnancies is a grave domestic problem." Fifty-four percent of all births to teenagers in the United States in 1974 were conceived out of wedlock and about two-thirds of these babies were born out of wedlock. In addition, one third of abortions performed in the United States are on teenagers.

Currently used contraceptive methods are in general quite safe – and certainly, for women up to the age of 40, safer than the risks associated with pregnancy. For example, Dr. Kenneth J. Ryan, chairman of Harvard Medical School's department of obstetrics and gynaecology, said: "The maternal mortality rate for pregnancy is 20 per 100,000 in developed nations and averages 40 per 100,000 where medical care is less advanced. The mortality rate for the pill user is 3 per 100,000 . . ."

The contraceptive pill is also the most effective method of birth control. In fact, Dr. Ryan said, there is an inverse relationship between success of a contraceptive method in preventing pregnancy and the safety of the method used. But the lower safety of the most effective methods is compensated for by removal of the risk inherent in the extra pregnancies they prevent.

Thus the risk of death for women taking the pill is five-fold lower than that for women who use no contraceptives and risk pregnancy instead. The so-called "safer" methods, such as the diaphragm or the condom, may on balance be more dangerous than oral contraceptives to the extent that they are less effective in preventing pregnancy.

Despite this, current methods of contraception still have many drawbacks. Pill users do risk side effects, ranging from benign liver tumours, myocardial infarction (heart attack), and ectopic pregnancy (one that occurs outside the womb), to gall bladder disease. The side effects may even include malignancies of the uterus and the breast, though to date this has not been proved. "Since it is well known that the development of a malignancy may take many years, this issue cannot be regarded as settled," said Dr. Elizabeth B. Connell, associate director for health sciences at the Rockefeller Foundation.

Dr. Connell went on to list side effects of the intra-uterine devices (IUDs), including perforation of the uterus at time of insertion, development of pain and bleeding necessitating removal, and increased risk of spontaneous abortion with the Dalkon shield (a variety of IUD) when it was left in place after pregnancy occurred. Infections were increased almost seven-fold with almost all IUDs, sometimes making future childbearing impossible, Dr. Connell said, suggesting to some that women who had never had children should not perhaps use them. And as with the pill, there is increased risk of ectopic pregnancy.

All these risks, reported in the press, have led in recent months to an increasing number of women returning to safer but less effective methods of contraception, Dr. Connell said.

The authors of *Reproduction and Human Welfare* and the experts assembled at the Ford Foundation news briefing discussed a number of promising avenues of research to develop alternatives to current contraceptives. These included an anti-pregnancy vaccine (see page 12); a pill for

males to suppress sperm formation; drugs that keep the fertilized ovum from implanting in the womb; longer-acting contraceptive agents that can be given by injection, implanted under the skin or absorbed through an inter-vaginal ring; and a substance that, when administered to a young male, would allow him to develop normally sexually but would block sperm production until he was ready to become a father.

The male pill of the future probably will contain the male sex hormone, testosterone. It will have to be taken with absolute regularity, because sperm reproduction would begin immediately the user stopped taking it. Tests already have been carried out with such a pill.

The proposed contraceptive for the young sexually active male who is not ready to become a father is so far just hypothetical, but it is theoretically feasible. The proposal follows on the very recent discovery of a substance that may be a hormone, produced by the Sertoli cells in the testes. The substance has been named inhibin because it inhibits another hormone, FSH, believed to be necessary for formation of spermatozoa. If this substance could be administered orally or otherwise, it could prevent sperm formation until fatherhood was desired.

Current female oral contraceptives use a high dose of estrogen to block ovulation — and it is this that causes the side effects. Another way to prevent pregnancy would be to block the action of the hormone progesterone, which is absolutely necessary to prepare the uterus for the implantation of the fertilized egg. This method would avoid overdosing the woman with a hormone and thus upsetting her metabolism. A contraceptive that would block the action of progesterone (which is required for little else than conception and maintenance of pregnancy) is believed to be possible given adequate funds.

Four long-acting injectable contraceptives for women are already being used in various countries (they are effective from one to three months). They are well received because women in developing countries (and some in the United States) believe injectable drugs are more effective and they are used to receiving them. The drugs are also easily administered by relatively untrained personnel. Research is necessary to remove the major side effect — abnormal bleeding and cessation of menstruation. Clinical trials have also been undertaken on steroids inserted under the skin, which could be effective from six months to six years. And a vaginal ring has been tested that contains a contraceptive steroid that is absorbed through the vagina. The ring is fitted by the wearer and can be used for six months.

To develop such methods — and possibly others — the authors of *Reproduction and Human Welfare* say about \$500 million will be needed by 1980. And the bulk of the funds will have to come from governmental agencies, principally in the United States, Europe, Canada, Israel, Australia and Japan, and the international assistance agencies. □

Science writer David Spurgeon is director of the IDRC's Publications Division, and editor of Science Forum.

Birth control methods of the future may include a nasal spray now undergoing trials in four countries. The spray works by depressing the centre in the brain that releases hormones necessary for pregnancy, says its developer, Dr. T.C. Anand Kumar, of the Department of Anatomy of the All-India Institute of Medical Science.

His experiments were described with several others on the frontier of birth control research at a recent seminar organized by the Zoology Department of Delhi University.

The active ingredient of Dr. Kumar's spray is a minute dose of progesterone, the female hormone used in birth control pills. The two-microgram dose is sprayed up the nostril six to 10 days after the menstrual cycle begins. No side effects were found in extensive experiments on monkeys, Dr. Kumar said.

His institute recommended the spray to an international organization which is now testing it at two centres in India, three in Korea, in Mexico and in London, England. Dr. Kumar says the spray needs at least two years more testing in experimental field trials.

Dr. M. R. Prasad, of Delhi University's Zoology Department, gave a German-produced drug called cyproterone acetate to male lab animals. He found sperm cells did not mature as a result. Sperm production was not reduced, but normal animal mating resulted in no pregnancies. The World Health Organization (WHO) took up Dr. Prasad's animal results and arranged for clinical tests in Germany and at India's National Institute of Health and Family Planning (NIHFP).

Dr. N.R. Moudgal, a biochemistry professor at Bangalore's Indian Institute of Science, used an injected animal antibody to neutralize the hormone released from the fertilized egg that keeps the fetus-to-be attached to the wall of the uterus. With this hormone neutralized, monkeys which were injected in the first month of their missed period, had normal menstruation three days after injection. The process now awaits clearance from the All-India Institute of Medical Science, for human experimentation to neutralize the human hormone, chorionic gonadotrophin.

Another All-India researcher, Dr. K.R. Laumas, has had 100 percent success with reversing sterilization in rats. In vasectomy the sperm-carrying tubes are cut, making the sterilization permanent. Instead, Dr. Laumas inserts a thread-like copper-alloy wire into the tube. This blocks sperm and sterilizes the rat. To reverse sterilization, the wire is simply removed in another operation. Dr. Laumas is continuing the experiments in monkeys.

India's Central Drug Research Institute has developed a new drug called centchroman, believed to have potential as a post-coital ("morning after") contraceptive. It has worked on several kinds of laboratory animals, and may now be tried on humans, the seminar was told.

Meanwhile, a recent report from the NIHFP cautions, "Although some effective methods for contraception are available, none can be said to be free from some drawbacks, either in the form of side effects and/or in lacking ease and simplicity of use. A large number of people are taking chemical and biological preparations as a result of modern medical public health and family planning practices. There are wide gaps in our knowledge in these fields, particularly in that pertaining to the human being."

The report points out that birth control is evolving into family planning, and will become family welfare planning, making the scientific objective much wider than mere family limitation.

The objective is now extended, the report says, to include total family welfare, including spacing and limitation of children, treatment of the infertile, mother and child care, and ultimately an improvement in the quality of the population.

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China – a matter of motivation



From the chaotic, underdeveloped and poor nation it was 27 years ago, China has emerged as a nation which can be proud of its achievements. Its birth planning program is one of these.

The IPPF, in its search for successful family welfare planning programs, has organized two tours of China in the recent past to study the Chinese experience at close quarters.

Contraceptives are now readily available in China at no cost, and the pill is dispensed without prescription. In the event of a contraceptive failure, a woman has convenient and safe abortion services at her disposal. The availability of such services depends to a large extent on the "barefoot doctor." This cadre of medical personnel perform yeoman service, especially in the rural sector. They are not only the distributors of conventional contraceptives but also the motivators for sterilization and the insertors of IUDs. This is just one aspect of their work, as they attend to other curative and preventive health care as well.

The Chinese do not practise population control in the strict sense of the word. Family planning is encouraged to enable men and women to work hard and contribute more to the National Development Program. Therefore every man and woman is "educated and motivated" to practise family planning and to have only two children.

The social benefits in old age, such as the guarantee of 70 percent of an individual's salary as pension, together with the assurance of food, clothing, housing, medical care and even a funeral, reduces the need for a big family. The minimum age for marriage in China is 18 for girls and 21 for boys, but the motivation to late marriage has brought the average age of marriage to 24 for women and 27 for men. The norm of a two child family is widely accepted and practised.

The implementation of policies in urban and rural China is decentralized via a series of organizational units. In

the countryside, the basic unit is the production team. Several teams are organized into a production brigade and several of these into a commune with anywhere from 10,000 to 60,000 members.

Population programs (as any other program) are implemented by means of consultation at all three levels. Suggested targets are transmitted to the base, where the production teams are free to draft their own local programs to meet them. Periodically, the leadership at all three levels must stand up at meetings to explain policy measures to the masses and also solicit their opinion.

Every year, the members of each production team, together with the cadres, discuss and decide upon how many babies should be born in the next five years and who is to bear them. Priority is given to newly-married couples, and those whose youngest child is closest to five years old. Adjustments are made throughout the year to accommodate unplanned pregnancies, temporarily separated couples, etc. It is the people at this level who are in the best position to make such decisions.

The state bears all costs relating to birth control and pays compensation for work-time or earnings lost when operations are undergone. For example, a tubal ligation entitles a patient to up to 28 days of recovery time with full pay and an induced abortion up to 30 days. Such payments are not in any way to be compared with the material incentives offered in other countries; they merely compensate for wages lost during hospitalization and recuperation.

Local educational and motivational work is carried out by committees on planned birth, and includes "political evening schools", film and slide shows, broadcasts, exhibitions and "cultural shows". They also arrange for medical personnel to explain contraceptive methods at local public meetings. The committees use all the institutionalized small groups to full advantage, and

since virtually everyone above school age belongs to some small group, no great organizational effort is needed to get the message across.

Another aspect of the Chinese program to change traditional values and practices is the effective use of propaganda. A good example is the campaign to "Criticize Confucius". Confucian beliefs support preference for male children ("A man without sons has no posterity"), large families ("A large family is a happy family") and the subjugation of women. Now the thoughts of Mao Tse-tung have replaced those of Confucius, and in workshops there are posters showing a woman holding a monkey wrench and captioned, "Times have changed. Men, women, the same".

How much of this could be achieved without the decentralized administrative apparatus — the revolutionary committee — which the Chinese have established at every level, is questionable. Every individual belongs to groups both where he lives and where he works, and these groups set goals for themselves and take responsibility for meeting these goals. The Chinese have thus eliminated a complex bureaucracy where decisions are handed down from above to be implemented below. Such bureaucracies plague many developing countries and discourage individuals from accepting responsibility. In China, however, responsibility and authority are delegated to the lowest possible level. Continual self-criticism and self-improvement have become a way of life and the general feeling is that, although they have come a long way, they still have a long way to go. □

This account of population policy in China was prepared for IDRC Reports by the Indian Ocean Regional Office of the International Planned Parenthood Federation. It is based on recent reports in IORO-IPPF's monthly magazine Future, which is supported by an IDRC grant.

Sub-fertility: the other side of the problem

Annick Lapous

While world attention is focused mainly on the issue of overpopulation and priority is given to family planning programs in order to control the birth-rate, a contrary problem has emerged in Africa: the question of unwanted sub-fertility and infertility and its consequences for development.

Fertility has been defined as the actual ability of individuals to reproduce. It is measured by counting live births, and differs from fecundity which is the biological ability to reproduce. Sub-fertility is the relative inability of a group or community to maintain a birth rate equal or superior to the general mortality rate. Infertility is the incapacity to impregnate or to carry a pregnancy to live birth.

There exists in Africa a large "sub-fertile" area. From Cameroon and Gabon in the west, it stretches as far east as Uganda, and includes the Congo, Zaire, the Central African Republic and Sudan. However, the differences in fertility levels are not as marked between countries as they are between groups. Two neighbouring groups may have quite different levels of fertility. Dr. Ann Retel-Laurentin, a researcher at the *Centre national de la recherche scientifique* (CNRS) in Paris, and the author of several articles and books on the subject, reports for instance that in Upper Volta, women of the Bobo-Oulé tribe aged over 45 have an average of three children, while their neighbours, the Mossi, have approximately six. In Nigeria a birth rate of 32 per thousand was reported at Igbo-Ora in 1964, and more recently 50 per thousand in East Central State.

In the context of rural Africa, where reproduction is considered an important social value, sub-fertility and infertility have serious social, economic and health consequences. A village woman who, after several months of marriage still is not pregnant, is very badly

looked upon by the people around her. Afraid that she will be abandoned by her husband, she may go through the various traditional psycho-therapeutic techniques practised in her village. If these prove unsuccessful she may, as a last resort, go from man to man until she conceives. While doing so she may contract a venereal disease or, because of her anxiety, abort before she even has time to realize that she is pregnant. Repeated abortions can provoke a secondary infertility that can only be cured by careful medical attention — often difficult to obtain because of the lack of medical facilities. Surveys conducted by the Wesley Guild Hospital in Nigeria revealed that some women spent the equivalent of a year's income on various cures during the first five years of their infertility.

While many factors may be responsible for the phenomenon, the fact that some sub-fertile pockets can be found in groups sharing the same socio-cultural characteristics strongly suggests that medical and pathological factors have a major role to play in determining the fertility level. Venereal diseases, which are common in cases of sub-fertility in many parts of Africa, have received much attention, but other diseases may also play a role. They can be endemic (sleeping sickness, malaria, tuberculosis) or genetic (consanguineous unions and their incompatibilities).

Despite the interest expressed by the World Health Organization (WHO) in 1969 to conduct research in this field, and recent efforts to establish maternity units in various locations, few programs have yet been launched. In July 1972, however, a World Fertility Survey was begun in order to provide scientific information that will enable countries to describe and interpret their population's fertility. In March 1973 the UN Economic Commission for Africa (UNECA) appointed two of its members to participate with the University of Ibadan in the design of a survey outline. An international workshop, supported by the IDRC, was held in Ibadan later that year at which scientists from various disciplines agreed on uniform definitions of fertility, sub-fertility, infertility and sterility. They also examined the factors affecting fertility levels, established an action policy and outlined future surveys.

The World Fertility Survey will be completed in June this year. It should be of particular interest to governments concerned with a low fertility level in certain parts of their countries. It also brings into question whether family planning services, instead of limiting themselves to controlling births, should not extend their activities in order to help thousands of women who silently suffer. □

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Family planning clinic in Mali: should they be equally concerned about sub-fertility?



Rich men's toys, or development tools?

Ernest Corea

Ernest Corea is associate director in charge of public affairs in the IDRC's Publications Division. He was the editor of the Ceylon "Daily News" and foreign editor of the "Straits Times" in Singapore before he joined the Centre. The following article is based on a paper entitled "Satellite Communications: Progress, Prospects and Problems in Asia", given at a seminar on satellite communications and development organized by the Institute for International Cooperation, University of Ottawa.

Arthur C. Clarke, the scientist and writer, relates a story of British reaction to an important event in the history of communications technology — the invention of the telephone. The British Cabinet was called into special session, he says, to consider the implications of the event. The Postmaster General was asked whether in his considered view the "old country" should import and absorb the new technology. The august official is said to have replied with a touch of asperity: "Certainly not, gentlemen. This may be a good invention for America, but not for Great Britain. We have plenty of messenger boys here".

Mr. Clarke perhaps finds some malicious glee in recounting this myopic response to a revolutionary innovation in communications technology. For there was a time when his own predictions about and hopes for the future of satellite communications were received in much the same way. He encountered disbelief when he said 31 years ago that rocket technology and microwave engineering could be combined to produce a global system of communications technology, "thus transforming the world into an electronically-linked global village".

The technology of satellite communications has made several giant leaps in the intervening years, and awesome possibilities have become a part of our lives in a matter of decades. As Clarke describes the state-of-the-art today: "The wiring of the electronic global village is now complete. But not all the fittings are yet installed. When they are, the world will be changed

beyond recognition". Or, as Henry Kissinger put it: "Satellite technology offers enormous promise as an instrument for development. Remote sensing satellites can be applied to survey resources, forecast crops, and improve land use in developing countries. They can help foresee and evaluate natural disasters. Modern communication technologies, including satellites, have large untapped potential to improve education, training, health services, food production, and other activities essential for development".

That is the optimistic view, and it is a view to which many Asian politicians and planners subscribe. There is a pessimistic view, too — or perhaps more accurately, a concerned view — with fears that "galloping communications technology" will widen the gap between industrialized and developing countries. Doubts have also been raised about the capacity of Third World societies to absorb advanced communications technology.

Satellite technology has already developed its own specialized and exotic jargon, while some developing countries are engaged in the task of refining their calligraphy or expanding the somewhat restricted vocabularies of their national languages. Some of the villagers who were the audience of India's recent Satellite Instructional Television Experiment had never seen moving images before. Scientists in Austria, Switzerland, and West Germany have been able to participate in a conference held at Houston, Texas on cancer and tuberculosis, without leaving the comfort of their homes. They were hooked into the event via satellite. In many Asian countries, on the other hand, governments are finding it increasingly necessary and practical to deploy basically trained paramedics, who traverse footpaths or bumpy country roads, delivering the messages and the appurtenances of health care from door to door.

Will satellite communications create an excessive cultural shock in a society that is still largely traditional? Developing countries are plagued by ever-growing balance of payments deficits, shattering burdens of loan-repayment, and widely fluctuating prices for their primary commodities. Is satellite communication a luxury they can afford? Conversely, must these countries forever remain at the far end of human development, while the rest of the world thrusts itself forward towards new frontiers, widening the gap between themselves and the poorer nations of the world in the process? Are the long-term benefits of advanced communications technology so compelling that they warrant phased investment by developing countries?

These and related questions have to be considered by each developing country within the context of its own goals, resources and limitations. They

need to be assessed, too, against a wider and fundamental question: can the transformations inherent in the process of national development be accomplished without the application of science and technology — appropriate, locally derived, adapted or whatever — to various parts of human endeavour that make up the sum of human life?

In the distant past, many Asian countries boasted complex irrigation facilities, effective sewerage networks, techniques for recycling what might otherwise have been considered agricultural waste material, and so on. The massive and ornate temples of Asia that have survived the ravages of time, are obviously the product of formidable expertise in construction engineering. Surgeons at ancient Nalanda University were said to have been experts at trephination. Physicians in South and Southeast Asia used *ekaveriya* (*rauwolfia serpentina*) to treat hypertension many, many years before the world's big pharmaceutical companies bottled the drug as a pill.

Are today's descendants of men and women who possessed and used engineering, medical and other skills in the past unready for modern science and technology, including the technology of satellite communication?

Many governments of developing countries in Asia do seem determined to tap the benefits of satellite communications technology for their countries. Several have joined the Intelsat consortium, and have built their own ground stations. Many, including Bangladesh, which is usually listed among the world's "least developed" countries, are building up their expertise to participate in remote sensing programs. Indonesia has a domestic satellite in orbit. India recently concluded a crucial experiment in the use of satellite communications for development. A domestic system established in Malaysia last August electronically linked Peninsular Malaysia with other parts of the federation.

Three years ago, a United Nations study pinpointed four areas in which satellite systems could be particularly beneficial. These were communications, meteorology, earth resources surveys and geodesy. Some of this potential has already been realised, and the literature about these accomplishments is substantial. Developments in all the areas of application outlined by the UN study have been significant, some of them exciting. The IDRC is already involved in training scientists from several developing countries in the interpretation of survey data provided by NASA's LANDSAT satellites — a cooperative venture vital to the rapid development of national resources (see *IDRC Reports Vol. 5 No. 3*). For myself, I am particularly hopeful about what the satellites might eventually do in an area sometimes neglected or misun-

derstood by scientists and policy makers alike: the use of communication as a component of development.

The immense potential of satellite telecommunications may be seen if one remembers that in Asia the media are not organs of "mass" communication as known in the industrialised West. Most of the rural populations of Asia remain virtually excluded from the conventional media. Most of Asia has not reached the "minimum desirable standards of mass media availability" formulated by Unesco in the 1960s — 10 newspaper copies, five radio receivers and two television receivers for each 100 inhabitants. Consequently, Asia's rural peoples have as low levels of access to communication as to, for instance, abundant food or adequate housing. Satellite communications hold out the promise of taking the message of development to these peoples, cutting across distance and time and, in the process, of helping to move rural Asia away from the corrosive perils of poverty.

The most significant Asian experiment in the use of satellite communications as part of the development apparatus, India's Satellite Instructional Television Experiment, better known by the acronym SITE, ended last August. The effects of the year long experiment are now being assessed. A comprehensive process of post-experiment evaluation was built into SITE, and when this evaluation is complete in mid-1977, other developing countries should have a set of indicators based on actual experience, rather than conjecture, on which to base their own plans.

SITE was very much the brainchild of the late Dr. Vikram Sarabhai who, as head of the Indian Space Research Organization (ISRO) felt that the most appropriate and justifiable application of space technology would be in

relation to national development. In January 1967, ISRO, with the Indian Agricultural Institute, All India Radio and the local administration of New Delhi began a pilot agricultural television project in 80 villages near Delhi, which had India's only television transmitter at the time. The aim of the project was to test the effectiveness of educational television in a rural setting. The results of the 1967 experiments were so encouraging that later in the year ISRO sent a mission to NASA (the US National Aeronautics and Space Administration) to examine the available technological options for a nationwide television system in India. The SITE experiment, as a joint venture with NASA, was one of the mission's recommendations.

In May 1974, America had launched ATS-F, the sixth in a family of applied technology satellites. Whereas messages from other satellites can be received only by multimillion dollar earth stations, ATS-F can accurately beam its programs direct to fairly simple antennas, built at the cost of a few hundred dollars and strategically placed in areas covering small clusters of television receivers in homes, schools, or community centres. This was the satellite made available by the Americans for the SITE experiment.

The overall objectives of the experiment were to test the effectiveness and long-term prospects — in terms of cost, local technical capability, programming, and audience response — of instructional television via satellite in areas such as family planning, teacher training, primary education, health and hygiene, agriculture, and national integration. Some 2400 villages in six states received their programs direct from ATS-F. The programs were rebroadcast from ground stations in Ahmedabad, New Delhi and Amritsar to another set of approximately the same number of villages. An estimated five million people viewed 1,200 hours of SITE programs.

SITE villages were carefully selected by a number of criteria including their backwardness because Indian planners were anxious to study the impact of instructional television in areas previously unexposed to sophisticated modes of communication. A 10 foot antenna made of chicken mesh was installed in each village, together with a television set. Electricity from the nearest supply point was run into most villages where there was no electrification. A few villages were supplied with a set of two heavy-duty 12-volt batteries. The total cost of this hardware — all made in India — is said to have been about \$500 per village.

Programs used local ballad singers, folk musicians and rural men and women with no previous broadcast experience, as their "stars". Instruction was presented in the simplest possible terms, using examples to which rural

NASA's LANDSAT satellite provides valuable data on earth resources to many countries.

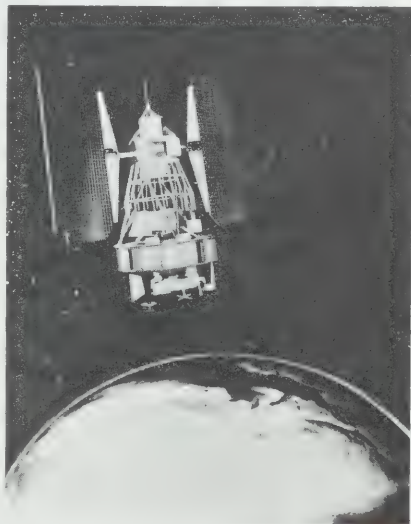


Photo: NASA

Tropical diseases

THE ENEMY WITHIN

Alexander Dorozynski



Photos: WHO



Top: Egyptian researcher examines snails from the Nile Delta that carry schistosomiasis parasites. Above: These fertile fields in Afghanistan were until recently useless swamp land, a breeding ground for malarial mosquitoes.

peoples could relate, keeping in mind the fact that many viewers were illiterate. An agricultural program used "fist width" as the measurement to describe the most suitable distance between plants. A program on dental hygiene described how the thin branches of certain trees could be woven into rough-and-ready toothbrushes.

The advantages SITE demonstrated from the beginning were speed, and the possibility of extensive coverage. Given the necessary backup services and support, a satellite can cover the entire country as soon as it is operational. Satellite communication, however, does not come cheap, and a recurring argument against its use is that it requires enormous amounts of money that could be better spent. India's SITE group has examined this objection closely, and a comment made by SITE's Professor E.V. Chitnis is worth noting. He said: "Many people ask us whether it would be better to provide tube wells and drinking water instead. However, what one is attempting to do through SITE is not to give television sets to villages, but to make them self-reliant and to get them new information which will enable them to do something worthwhile for themselves — to learn to work together and acquire new skills, including those required for digging wells".

Another important aspect of SITE was that it was conducted in a country with a high degree of industrial skill. There is grinding poverty in India, to be sure, but there is also advanced industry. Industrial production in India increased by 13 percent in the first half of 1976. In fact, India is an exporter of industrial know-how. Its electronics sector had the expertise necessary to turn out the hardware for the experiment. Equally, India was able to produce a range of instructional programs for the experiment.

SITE also paid attention to the effectiveness of interpersonal communication. One can stimulate traditional peoples with images, music and words, to change their attitudes. But experience has shown that changes brought about in this manner — however scientifically sound, however economically benign — will run into problems if the people directly affected by change are thought of only as "targets" and not as participants.

That is why the application of satellite communications to development has to be part of a wider system of communications, integrating old techniques with the new technology. This is a field in which some research has been done, and in which much more remains to be done. The best scientific and economic policies that man can produce will be of little relevance unless and until they are disseminated, understood, modified if need be and, above all, wholeheartedly accepted. □

A war is being fought in the tropical regions of the world. It is a war in which mankind has been on the losing side for too long. A war whose cost in human lives and suffering, and in economic terms, is incalculable. A war in which, until now, the forces of mankind have been woefully undermanned and poorly supplied. A war against some of the lowest forms of life on earth: parasites, carriers of tropical disease — the enemy within.

Parasites — protozoa or worms — are the cause of the major diseases such as malaria, sleeping sickness, river blindness, and other diseases that affect several hundred million people and can eventually blind, maim or kill their victims. Yet, according to Professor Christian de Duve, a Nobel-Prize-winner in medicine, "They are puny enemies indeed. The pathogenic parasites certainly occupy the bottom of the scale. They really have major weaknesses and must be quite vulnerable."

Why is it, then, that in spite of all the miracles of modern medicine these "puny enemies" remain a major obstacle to development in much of the Third World? Simply because tropical disease research has hardly benefited from the explosion of knowledge in bio-medical sciences that has taken place in the developed world. In the words of Professor G.J.V. Nossal, Director of the Walter and Eliza Hall Institute of Medical Research in Melbourne, Australia, it is "in no sense an indictment of the professional researchers in this field, rather it is the result of disordered global priorities in health research which have limited the supply of such researchers."

The World Health Organization (WHO) estimates the global annual investment in tropical disease research at about \$30 million, which is a mere pittance in comparison to the huge budgets devoted to other areas of bio-medical research.

Says Professor de Duve, "My strategic recommendation, therefore, is that the forces of the new biology be enlisted for a detailed analysis, at the cellular, subcellular and molecular level, of the various parasites that infest man, and of their relationships with their human and animal hosts. I have no doubt that out of such a study, powerful new preventive and curative means will emerge."

In the past year the WHO began mounting just such an attack on these diseases. With the support of the IDRC and other agencies, it drew up a Special Program of Research and Training on Tropical Diseases. Professor Nossal, who is also a consultant to the new WHO program, sees it as a "giant step" towards correcting the imbalance in research priorities.

The approach was novel, and the outlook promising. There remained only one major element of uncertainty: would there be enough money forth-

coming to carry out such a major long-term effort over a period of at least 10 years? That question was at least partially answered in December when 35 delegations met to examine the progress of the Program. Support for its continuation was unanimous, and several promised long-term support on an annual basis.

A total of \$7.5 million was pledged to the Program for 1977. This is perhaps half the amount the optimists had hoped for. However, the Program now has funding for 1977, and some commitments for its future.

Six diseases have been selected as the initial targets of the WHO's Special Program:

Malaria is one of the most widespread diseases in the world, affecting some 200 million people. In Africa, about one-fourth of all adults suffer from malarial fever at one time or another, and at least one million children die of the disease every year. In several areas of Asia and South America, *Plasmodium falciparum* (one of the four malaria parasites, responsible for the severest forms of the disease) has developed resistance to major anti-malarial drugs. In Asia resistant strains have progressed westward to reach the Indian subcontinent, and they represent a great threat to Africa, where *P. falciparum* is the main malaria parasite. In addition, mosquitoes have developed resistance to some insecticides and, as a result of increased costs and reduced international assistance programs, many countries can no longer afford to carry out intensive anti-malarial campaigns.

The tsetse fly — bringer of sleeping sickness.



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Schistosomiasis also affects about 200 million people. Free-swimming larvae (or cercariae) penetrate through the skin of a person entering the water, migrate to the liver where they mature into adult worms that settle inside blood vessels and go on laying eggs for several years. Infected people may become emaciated with an enlarged spleen and liver, and many develop cancer. The incidence of the disease has been increasing in Egypt and Sudan since the creation of Lake Nasser, and in Ghana since the construction of the Akosombo Dam on Lake Volta. In Northern Nigeria there has been a three-fold increase in three years around the lake created by the Kainji Dam, and even in the semi-arid Arabian Peninsula irrigation has introduced schistosomiasis to regions where it did not previously exist.

Filariasis affects about 300 million people. Transmitted by mosquitoes, it causes elephantiasis of the legs, arms and genitals, by obstructing the flow of lymph.

One form of filariasis is **onchocerciasis** (or river blindness), transmitted by *Simulium damnosum* — the black-fly. In the upper basin of the Volta river, more than a million people are infected and thousands are blind. A costly control program has been initiated in seven of the most affected countries; it involves the spraying from helicopters of the often inaccessible fast-flowing streams where the blackflies hatch, and the treatment of infected persons; but there is a need for better drugs, that have fewer side effects and are more effective against adult worms.

Trypanosomiasis affects some 10 million people. The African form of the disease, sleeping sickness, is endemic over about 10 million square kilometres of land, much of it fertile but abandoned to the tsetse fly, vector of the disease. The South American form of trypanosomiasis is Chagas' disease, incurable and fatal (it destroys the heart).

Leprosy, one of the most perplexing infectious diseases, also affects at least 10 million people. Although Hansen's bacillus, or *Mycobacterium leprae*, was described more than a hundred years ago, it has not been grown in the laboratory (or, at least, no reported culture has yet been confirmed).

Leishmaniasis, is caused by various protozoa of the genus *Leishmania*. Two of its forms are lethal: the South American espundia, which kills by destroying the face, and visceral leishmaniasis, or *kala azar*.

There are several reasons why the timing for a renewed effort to develop remedies against these diseases is propitious. The means to control and treat them are limited, and there is relatively little research directed towards new remedies. A number of recent findings, however, both in parasitology and fundamental biology, can be used to explore new approaches. Several such approaches have been identified, and

"task forces," or scientific working groups have been formed by the WHO to pursue specific goals. These consist of top scientists in various disciplines.

One group, for instance, is concerned with immunology of malaria. Its ultimate goal is to develop reliable, long-acting vaccines, which would undoubtedly revolutionize the control of malaria. Professor William Trager of the Rockefeller University in New York, a member of the group, has succeeded in maintaining a continuous laboratory culture of *Plasmodium falciparum* for three months — a significant step towards the development of a vaccine.

The harvest of a large number of *Mycobacteria leprae* is also possible since researchers in Louisiana found in 1971 that injection into nine-banded armadillos causes massive infection of the animals. Previously, infection had been achieved only in mouse footpads, and was very limited.

The WHO's scientific working group on immunology of leprosy has already engaged in antigen preparation and purification, and three promising antigens have been isolated, one in Venezuela, one in the United Kingdom, and one in the USA. As with other task forces, the specialists from several countries meet periodically to coordinate their efforts. There is good hope that a practical vaccine can be developed, and a tentative schedule has already been established. If all goes well, field trials should start in four or five years.

Less is known of the immunological aspects of schistosomiasis, filariasis, trypanosomiasis and leishmaniasis, but there is, nevertheless, hope that vaccines can also be developed against at least some of these diseases.

Other participants in the Special Program are exploring the possibility of entirely new approaches, relying on recent bio-medical knowledge. Professor de Duve, for instance, is attempting to apply "lysosome therapy" to some of the tropical diseases. "Lysosomes," he says, "are essentially miniature stomachs, which occur in all cells. One of their principal functions is to serve in the digestion of food 'eaten' by the cells by a special capture process. As with humans, cells may be greedy or frugal, and they may exhibit a wide variety of tastes. Our purpose is to take advantage of these differences to kill certain cells selectively by poisoning their favourite food. To do this, we bind the poison to a carrier molecule in such a way that it will be released when it gets in the lysosome, that is, in the stomach of the cells that have eaten this poisoned food."

Experiments on mice carried out at the International Institute of Cellular and Molecular Pathology in Brussels, where Professor de Duve is director, have shown that such "selective poisoning" can be effective against at least one *Trypanosoma* parasite. A



This man is blind — a victim of onchocerciasis carried by the blackfly.

similar approach can be tried for the treatment of diseases such as schistosomiasis or onchocerciasis, caused by worms with very tough skins, whose weak points may be their "stomachs".

Enzyme therapy is another possible approach and interference with the parasites' nervous system could also be explored.

Vector control, likewise, can benefit from applied research, notably in the area of biological vector control. Such a project to control blackfly has been underway for several years in Upper Volta with IDRC support.

Researcher with a schistosomiasis control project in Brazil collects snails for laboratory tests.



These are "high technology" approaches, that require the commitment of skilled manpower and adequate budgets. Their goal is the development of remedies on the basis of knowledge of parasite function and biology, rather than through often empirical, large-scale screening, such as has been widely used until now in anti-parasitic drug research.

The purpose of the Special Program is not, however, limited to such research, much of which must be carried out in institutes, universities, and pharmaceutical laboratories in the developed world. The countries most affected by tropical diseases will be associated with the program.

At the beginning, the focus will be on Africa, which has the highest prevalence of the six diseases and where multiple infection is almost the rule. Several African countries have agreed to participate in and contribute to the program, and Zambia has offered laboratories in the large Ndola hospital complex for the creation of a multi-disciplinary research centre bringing under the same roof different aspects of laboratory research and clinical medicine. Strengthening of existing laboratories, creation of new ones if necessary, and training of additional indigenous personnel, are planned as part of the program to promote self-reliance in the very parts of the world where tropical diseases are prevalent.

The war, then, has been joined on several fronts. It will be a quiet campaign, but if it succeeds its impact on the developing countries and their peoples will be enormous.

Compared to "conventional" warfare, it will also be a very inexpensive campaign. \$30 million is about the cost of two modern jet fighters. □

BRIEFS

JOINT EFFORT TO CUT FOOD LOSSES

Five Southeast Asian countries — Indonesia, Malaysia, the Philippines, Singapore and Thailand — have begun a joint program aimed at devising new or improved postharvest systems to cut the present staggering losses of food grains. The International Rice Research Institute, for instance, estimates that no less than 37 percent of rice grains are lost each year in handling, processing and storage.

The new program was established by the Southeast Asia Regional Centre for Agriculture (SEARCA) in collaboration with the Canadian International Development Agency (CIDA), the U.S. Agency for International Development (USAID) and the IDRC, which has also been asked to serve as management agent for the program during its initial three-year phase. It is expected that other countries in the region may join the program later.

Policies will be set by an advisory board, made up of one representative from each of the participating countries, one from each donor agency, and an ex-officio member from SEARCA. At its first meeting in December, the board elected as chairman Mr. Jesus Tanchanco, Administrator of the Philippines National Grain Authority.

Mr. Tanchanco told the meeting that postharvest grain losses were "the big challenge of the future." Their task, he said, was "the minimizing of wastes, from the time the crops leave the farm gates until they reach the consumers."

MORE THAN A DOCTOR, A FRIEND

Ayurveda is a traditional Asian system of medicine, and in Sri Lanka the ayurvedic physician occupies an important position in village life. For the rural people he is usually the initial contact in case of sickness, and becomes both a friend and adviser on health matters.

Of the estimated 18,000 ayurvedic physicians in the country, some 10,000 are registered, and of these about 2,000 have received instruction at one of the training centres attached to the country's seven ayurvedic hospitals. Yet until recently the ayurvedic physicians' involvement in the country's overall health program has been minimal.

In July last year, however, a government training program was begun in association with the Family Planning Association of Sri Lanka to involve the ayurvedic physicians more closely in family welfare activities. Some 30 lecturers from the seven training centres attended a week-long session of lectures and demonstrations. After this initial training, the lecturers, together with resource personnel from the medical department, began conducting three-and-a-half day training programs at the district ayurvedic centres. Each of the 14 sessions will have from 25 to 40 participants, and everyone trained under this scheme will be issued a certificate of competence.

The topics covered range from family planning to infertility, from child care to nutrition, and if the first 14 training sessions prove successful, the planners hope that the Commissioners of Ayurveda will extend the scheme to cover more physicians, and promote their active involvement in the national family health program.

TECHNONET ENTERS PHASE TWO

When it was first envisaged TECHNONET, the industrial extension information and training network supported by the IDRC in Asia, was to have had six members. Today, as it enters its second three-year phase, the network has 11 members — the latest to join being the Bangladesh Small Industries Corporation.

At its third annual meeting recently the TECHNONET Council, composed of representatives of each participating organization, continued to develop the policy of self-reliance established at its previous meeting, approving a number of recommendations from its training and information committees, which had met prior to the Council meeting. These included the continuation of regional industrial extension courses, and the development of local courses, especially in areas where English is not the working language. Other new projects include special technical extension workshops, the first to deal with the food processing industry, and instructor training workshops.

In the information field, the Council supported the gradual development of an Asian Tech Briefs system (to eventually replace the technical reference service presently provided by the National Research Council of

Canada) and the accumulation of information in specific areas of expertise to add to the network's total technical information capacity.

Another of TECHNONET's long-term concerns is the development of a corps of professional industrial extension officers. To this end TECHNONET Centre has established a series of annual service awards for outstanding in-plant extension work.

HARNESSING THE WIND IN ETHIOPIA

Visitors to the Omo River region of south-west Ethiopia might be surprised to find the arid skyline dotted with what appear to be traditional Greek windmills. They are, in fact, locally designed and built, based upon the traditional sail windmill so common in the island of Crete.

Ten years ago the American Presbyterian Mission in Omo obtained four factory-made windmills from the US. These were an instant success, and many local farmers became enthusiastic about the possibility of irrigating their land with windmill-powered pumps. The cost (about US \$1000), however, was too high. So two mission members journeyed to ancient Crete to see if the traditional sail windmill could be adapted to Ethiopia. With a welding set as the only major capital investment, and a lot of volunteer help, the first modified "Ethiopian-Cretan" windmill was built.

Since then about one windmill a month has been produced, and the rate is increasing. The windmills have six or eight arms of metal tubing on which are stretched sails of synthetic sailcloth (this cloth is sturdier than local fabrics), using rubber loops cut from motorcycle innertubes. A large tail vane directs the sails that swivel to face the wind as its direction changes.

In a stiff breeze one of these mills may lift up to 5000 litres of water an hour. Problems such as purchasing materials and training the farmers in the building and maintenance of the windmills are being overcome gradually. As a result, many farmers in the region are, for the first time, producing sufficient food for themselves and their families, and some have even started selling surplus produce. In a region where malnutrition is widespread, that is a significant achievement.

IMPROVING SCIENTIFIC COMMUNICATION

Deans and professors of journalism faculties, and some working journalists, from Arab countries held a week-long seminar on scientific communication, in Cairo last December. The seminar was organized by the Arab Centre for Information Studies on Population, Development and Reconstruction, which has its headquarters in Cairo, and supported by the IDRC's Publications Division.

Thirty participants, from Morocco to Iraq, attended the seminar. Its main aim was to enable the deans and professors to exchange views on the role that scientific communication can and must play in the overall development process. As part of this exchange of ideas, they considered suitable curricula for training in scientific communication, and discussed a long-term strategy for improving the quality and expanding the scope of scientific communication in Arab countries, with special reference to the needs of media using the Arab language.

This was the first seminar of its kind in the Middle East, and by supporting it the IDRC helped to break new ground. Alexander Dorozynski, the Publications Division's associate director for the Middle East attended the seminar, as did representatives from the Arab League and the International Journalists Association.

The need to train competent media personnel was stressed by all participants and, to this end, it was decided that all the Arab institutes represented would attempt to adopt a common curriculum, with the emphasis on development communications. As a first follow-up, the Arab Centre in cooperation with the Arab League and Unesco will study the contents of the Arab media and determine their needs. The results of these surveys will be placed before a second seminar later this year.

The Cairo seminar also resolved to establish a standard journalistic and publishing terminology, and to set up a Development Dossiers service for the news media, journalism schools and government officials in the Middle East. The aim of the dossiers will be to provide up-to-date information about major science and technology developments through selections of exemplary writing in these fields.

Food Priorities in the Third World

Jean Steckle



Photos: Neill McKee

Bizanesh Fasha baking the daily bread.

Bizanesh Fasha is a housewife in the Indibir region of Ethiopia. Much of her day is taken up with the preparation of *kemuse*, the staple diet of the area. This bread is made from the fibres of *enset*, the "false banana" tree. The process of fermenting, grinding and cooking this starchy food involves long and tedious hours of labour, and the product is a poor quality food, very low in protein.

In many ways Bizanesh Fasha is typical of rural women in the Third World, most of whom must spend a large part of each day — often starting before sunrise — in the preparation of basic food. The reason is simply that governments of developing countries, in their all-out efforts to increase food production, have too often overlooked one vital factor: the conditions under which the food is used in the home, especially in the rural areas.

Agricultural policies have tended to concentrate on increasing cash crops and the development of food processing industries — often with an eye to potentially lucrative urban and export markets. This has resulted in relatively little attention being paid to the real needs of the rural people, especially women. Yet in some developing countries as much as 90 percent of the people live in rural areas, and most families must strive simply to maintain self-sufficiency in staple food crops such as maize, cassava and sorghum.

Also, until recently little research has been done on these traditional crops, and this, combined with the emphasis on cash crops for exports has resulted too often in a shortage of staple foods. To compensate for this, governments must import grains such as wheat and rice for sale in the rural areas. The wheat is often used to bake bread, and the rice is already threshed ready to cook — a convenience to be sure. But while this may reduce the drudgery of preparing meals, such foods are more expensive and not always readily accepted by the local people, nor do they provide a balanced diet when eaten as the staple.

There are more encouraging trends in some regions, however. Women have begun to specialize in growing more of the local foods for sale at rural markets. To increase their incomes, they often market such foods partially processed or even ready-cooked. This is a rapidly growing practice in many developing countries. It provides rural women with extra income without changing the traditional diet or farming practices. These women are pioneers, developing new and improved food processing and marketing systems in the rural areas. They deserve more support in their efforts to find new ways to become self-reliant and improve their way of life.

Such trends are a clear indication that it is important to determine priorities at the grassroots level in any attempt to

modernize food utilization systems. Although it is initially a costly process, government assistance is essential to raise standards of food processing at rural markets. Such assistance can contribute to the evolution and modernization of traditional food marketing systems for the majority of the people. The export market may be appealing, but rarely does the cash realized go to provide food to meet local demand. The resulting scarcity of staple foods diminishes the confidence of the rural people, and hinders the development of modern marketing and storage systems.

Some governments have already taken steps to ensure the production of staple foods and develop standards that are applicable to local needs. Systems of weighing, grading and pricing, however simple, are important in order to determine what consumers want, and to maintain steady supplies at acceptable price levels. Control of hygiene in the processing and preparation of food is also important to protect the health of the consumers.

To further develop and evaluate food utilization systems — and to ensure the right kind of modernization — it is necessary to study the day-to-day routine in rural households, particularly the processing and cooking of food.

Information on local trends can be obtained, for example, at clinics where mothers bring their babies for check-ups and weighing, at schools where snacks or lunches are provided, in group consultations with families, and through demonstrations and discussions with women's associations. Such in-depth studies provide a basis for large-scale statistical studies to indicate the most promising approaches for improvement.

The availability of appropriate food processing technology is an important motivating force. Many new ideas and techniques come from the rural women themselves, and much could be gained by an exchange of such information between communities, countries, even between continents. In Eastern Java, Nigeria and Zaïre different products are prepared from cassava using various simple home processing techniques. Many diverse countries might find they have a lot in common when it comes to food utilization systems.

In Africa neighbourhood mills for grinding local grains such as sorghum, millet and maize, are available in many rural market towns. They are a great help to the women who formerly had to prepare flour by hand, but they also have their drawbacks. Poor quality grain brought by one family may contaminate the quality grain brought by another. Spices and additives used in their grain by one ethnic group may not be palatable to others using the same mill.

In Maiduguri, Nigeria, an experimental milling system has been developed with the support of the IDRC that has

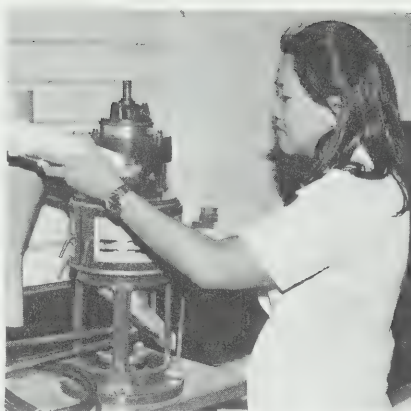
overcome many of these problems. It is government controlled with specific standards developed as a result of local consumer preference studies.

The mill has standard equipment for cleaning, dehulling, milling and sieving local grains, but remains labour intensive. The quality of the flour is maintained by tests in an adjoining kitchen, where experiments are also conducted in the preparation of noodles and fried snack foods using simple hand tools that can be easily adapted by local food vendors. Composite flours are also being tested to promote local grain production.

The project is being closely watched by other African countries facing similar problems, and the Centre has recently published a booklet on the first phase of the Maiduguri Mill Project (IDRC-TS2).

In the Philippines the tedious dehulling and processing of cowpeas to make flour and paste for various food products has been greatly reduced through research at the University of the Philippines, Los Baños, supported by the IDRC. Further tests are being carried out to adapt the techniques for use in rural homes and to meet consumer preference. Cowpeas are also widely used in Africa, but processed entirely by hand and by simple grinding equipment. An exchange of information and ideas between Africa and the Philippines could therefore be valuable to enhance the use of this nutritious food crop.

Perhaps the most important aspect of the food problem is malnutrition. In the Third World, diseases resulting from dietary deficiency and poor food hygiene are widespread and must be corrected in the home where the problem originates. To reach a scattered rural population requires an innovative, integrated approach: promoting improved hygiene and adequate



Small cowpea mill in use at the University of the Philippines project.

basic diet, by developing appropriate technologies, crop management systems and better storage and processing techniques.

The Ethiopian Nutrition Institute is the focal point for improving the food and nutrition problems in that country. A high protein composite flour prepared from local grains and soya called *faffa* has been developed and is distributed throughout Ethiopia as a dietary supplement for children. The chief nutritionist at the Institute is in close contact with the Agricultural Research Centre, where the agronomist in charge of sorghum research has discovered high lysine genetic material amongst some of the original traditional sorghum species. With IDRC support researchers are surveying the country to retrieve this material to use in breeding high-yielding, high-protein crops. Lysine is one of the essential amino acids often deficient in grains but found in protein from animal sources. Also in Ethiopia,

triticale — a new high-yielding, high-protein grain which flourishes at high altitude — is being tested in rural households to find out if its handling qualities are acceptable and comparable with the indigenous grains in the preparation of *enjera* bread. These household tests determine the type of laboratory tests required to overcome the specific problems identified by local women. This close liaison between the nutritionist, the agronomist, and the housewife is a good example of the team approach required to improve food utilization systems.

A similar approach was taken in the Caqueza project in a remote rural area of Colombia. Here, with IDRC support, an integrated rural development program was established in which research, education and training took place in the farmers' fields and in their kitchens, supported by the more formal institutions of government and university extension and research centres.

The challenge to governments, universities and other centres of higher education is to train young people to work directly with the rural population. People who will be sensitive to the culture and capable of using modern science and technology to help the people solve their problems for themselves.

This is the need: to adapt new and appropriate systems of technology to age-old practices of farming and food preparation, and to assist the small farmer by concentrating more on staple crop production, processing and trade. This would not only reduce the destructive drudgery that now must be endured by millions of women like Bizanesh Fasha, it would also provide more food, more variety and better nutrition for the vast majority of people in the developing world. □



The marketplace: any attempt to modernize food utilization systems must begin at the grassroots level.

Dr. Steckle is a nutrition scientist who has spent many years in Africa, most recently as associate director for the Agriculture, Food and Nutrition Sciences Division at the Centre's regional office for West Africa in Dakar. She is now a nutrition consultant with the Department of National Health and Welfare, Government of Canada.

STRETCHING

the filmmaker

The filmmaker's art has always been a precarious one, and Neill McKee, who heads the IDRC's audio-visual unit, is one man who is well qualified to testify as to just how precarious it can get.

McKee completed his first film on the Centre, a 22-minute documentary entitled *Stretching the Earth*, last September. In the course of gathering material over almost one year he underwent such trials as a narrow escape from an overturned Landrover at dusk on a country road in Senegal, a sleepless seasick night aboard a trawler off the Guyana coast, sharing a room with a handful of hungry tsetse flies in Kenya in order to film them at close range, and another nautical adventure in an apparently sinking barge with 20 fishermen off the Philippines.

Comments McKee: "At times I felt it should have been called 'stretching the filmmaker'. But in spite of a few mishaps, it was incredible how smoothly things went. I couldn't have covered half as much ground without the cooperation, encouragement and understanding of literally dozens of people who took time out from their own busy schedules to talk to me about their work, show me around and advise me on what, when and where to film for the best results."

In four expeditions McKee visited 77 project sites in 26 countries, and survived 104 take-offs and landings. Along the way he accumulated miles of 16mm. film, several thousand colour slides and black-and-white photographs and a collection of taped interviews with scientists and research workers of many nationalities.

What is it all for? The film was the first major production to result from the marathon trip. Giving a broad general view of the types of research currently supported by the Centre, it should be of interest and practical value to people involved in international development at all levels. Discussions have already begun with a view to getting the film shown on television in several countries in order to reach a wider audience.

Films with a regional emphasis dealing with the Centre's work in Africa, Asia, Latin America and the Caribbean have now been completed. These give more detail on the problems peculiar to each region, and the research being carried out there. Beyond this, several slide presentations have been produced — one was screened for a recent international gathering of home economists and nutritionists — and scores of photographs have been used to illustrate IDRC's scientific and general publications.

Film-making can be an expensive, complicated and potentially disruptive operation, especially in a developing country. McKee, however, prefers the low-cost, low-key approach. As a one-man crew he carries a movie camera, two still cameras, a tape recorder and a suitcase full of film stock, tapes and accessories. He aims to be as unobtrusive as possible, a technique he has come close to perfecting while producing nine development films in recent years.

"A few times I found myself in a village or a research station that had just been inundated by a full-scale film crew of four or five people," he says. "The negative reaction resulting from such invasions reinforced my opinion that the low-key one or two man

operation is best suited to filming development work."

The following items produced by the Centre's audio-visual unit are currently available on a free loan basis or may be purchased if required for permanent use.

Films

Stretching the Earth — on IDRC-supported research around the world, 22min., 16mm., French version available. May be obtained from IDRC Ottawa, or from any of the Centre's regional offices.

Common Task — on IDRC-supported research in Latin America and the Caribbean. 20min., 16mm., Spanish version available. May be obtained from IDRC Ottawa or the regional office in Bogota.

Continent in the Making — on IDRC-supported research in Africa. 24 min., 16mm., French version available. May be obtained from IDRC Ottawa or the regional offices in Africa.

Asia: the Search for Solutions — on IDRC-supported research in Asia. 24min., 16mm., English only. May be obtained from IDRC Ottawa, or the Singapore regional office.

Pâ-Noi, the Village Midwife — a co-production with the Faculty of Public Health, Mahidol University, and the Ministry of Public Health, Thailand, this is a film on Thai traditional midwives and their integration into the family planning service of their country. 17min., 16mm., French version available. May be obtained from IDRC Ottawa, or from the regional offices in Singapore, Nairobi and Bogota.

Slide shows

Some Food Priorities for the Third World (English and French)

Hawkers and Vendors in Southeast Asia (English only)

Rural Health Care (English and French)

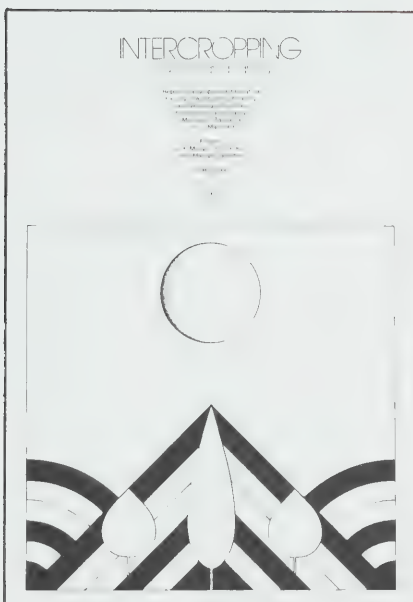
IDRC in East Africa (English and French)

Details of these and other productions will appear in future issues of *IDRC Reports* as they become available. For further information write to: IDRC Audio-Visual Unit, Box 8500, Ottawa, Canada.



McKee on location: the one-man film crew is less obtrusive.

New publications



Intercropping in Semi-Arid Areas, J. H. Monyo, A.D.R. Ker and Marilyn Campbell editors. Published February 1977, 72 pages, IDRC-076e.

This is a report of an IDRC-supported symposium held in Tanzania in May 1976, at which some 88 participants from 14 countries shared the results of their research on intercropping in the semi-arid tropics. The report contains summaries of 30 papers, a summary of proceedings and conclusions, a bibliography and a full list of the participants.

Computer Simulation of Soil-Water Dynamics: a Compendium of Recent Work, by Daniel Hillel. Published March 1977, 216 pages, IDRC-082e.

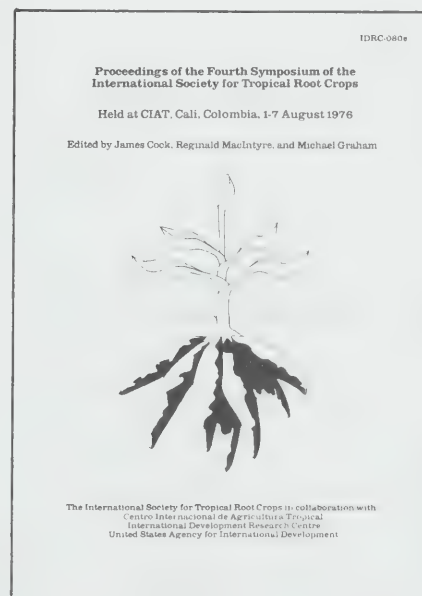
This monograph describes the formulation of a number of models simulating soil-physical processes, and illustrates the results obtainable from them. Intended mainly for problem-oriented researchers who are concerned with the theoretical rather than empirical aspects of agricultural and environmental research, it assumes a basic knowledge of calculus and some familiarity with computer programming. The author, a former IDRC Research Fellow, hopes to spur the interest of students of soil-plant-water relations in the possibility of applying simulation techniques as an extra dimension in their investigations.

Tsetse: The Future for Biological Methods in Integrated Control, Marshall Laird editor. Published March 1977, IDRC-077e.

Some 28 scientists from many disciplines have contributed to this work, making it more than a state-of-the-art review. It is, in the words of the editor, the first attempt to place between two covers the essential information on the status of existing knowledge of the natural enemies and diseases of one particular group of insect disease vectors, together with background information and projections of the types of research and development most likely to lead to practical biological control procedures.

Proceedings of the Fourth Symposium of the International Society for Tropical Root Crops, James Cock, Reginald MacIntyre, and Michael Graham, editors. Published March 1977, 277 pages, IDRC-080e.

This week-long symposium, supported by the IDRC, focused on four main themes: origin, dispersal and evolution; basic productivity; preharvest and post-harvest losses; and utilization. Over 170 scientists from 44 countries took part in the sessions, and the report includes a full list of participants together with summaries of the 60 papers that were presented, opening and closing addresses, and summaries in point form of the discussions that took place.

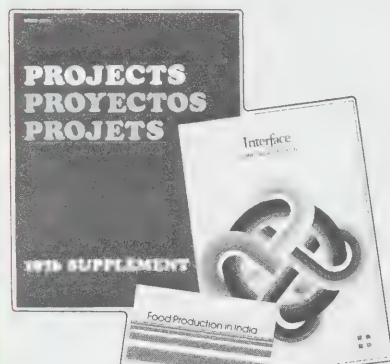


For details of how to obtain copies of these or other IDRC publications, see advertisement on the back cover of this issue.

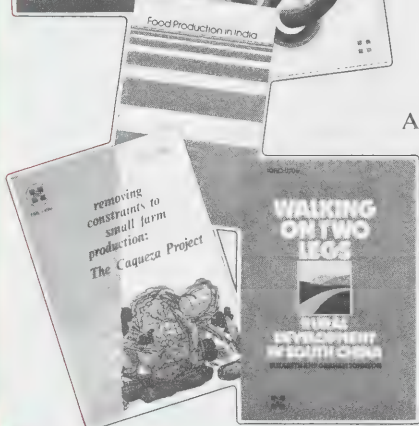
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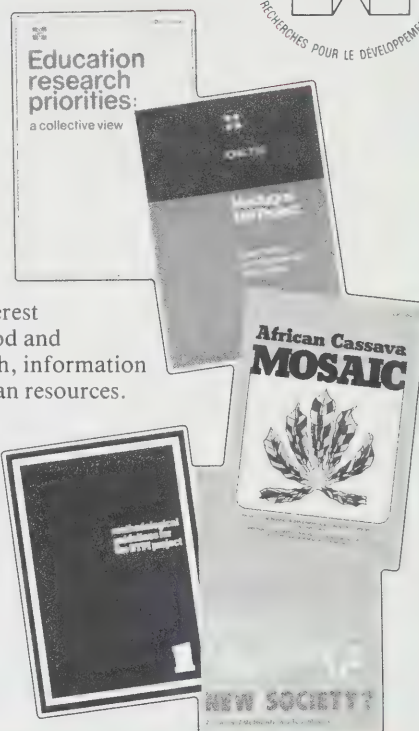
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Reports

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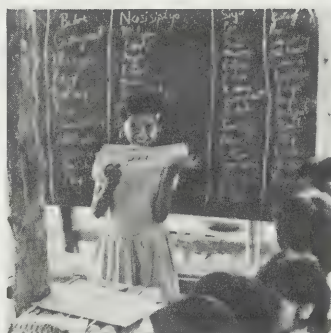
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Cover photo by Clyde Sanger: At Uling school in the Philippines, Rosita is both a teacher and a student. So are all the other children. See *Less schooling, more learning* on facing page.

3 **Less schooling, more learning**

Clyde Sanger reports on an exciting experiment in primary education in Indonesia and the Philippines.

6 **Medicine: the best of both worlds?**

Governments are showing renewed interest in traditional medicine in Africa, by Jean-Marc Fleury.

8 **Traditional midwives deliver**

In Asia, attempts to integrate traditional and modern systems are showing results, by J. Y. Peng.

9 **Dossier: Food**

Why do farmers not grow as much food as they could? Why do some people go hungry even in times of food surplus? These and other questions related to the global food situation are dealt with in a series of six articles in this *IDRC Reports* special feature.

17 **Science in development**

The information revolution, column by Alexander Dorozynski.

18 **Briefs**

People, projects, events.

19 **Viewpoint**

Readers' views on *IDRC Reports* articles.

20 **Health workers bridge the gap**

Report on a new film from IDRC.

21 **Bringing science to the people**

Popularizing science for development in Asia. *DEPTHnews* report.

22 **Commentary**

Are the news media partners in development — or adversaries? asks Albert S. Talalla of Malaysia.

23 **New publications**

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Less schooling, more learning



In the first hour of learning at Kebac 3, the programmed teachers from the higher primary levels take the younger students through a lesson of reading and comprehension in Bahasa Indonesia (the national language).

Article and photos by
Clyde Sanger

Of all peoples the Filipinos are fondest of inscribing exhortations on stone and setting them up in public places. Especially exhortations to youth, and to work.

Just inside the gates of Cebu State College, where the neatly dressed children crowd in early morning before classes, is a sitting statue of the poet, patriot and surgeon José Rizal, and on the plinth are cut his words to Filipino youth:

*"Hold high thy brow serene,
O youth, where now you stand;
Let the bright sheen
Of your grace be seen,
Fair hope of my fatherland!"*

And on arrival at the primary school in Naalad, the first of the five barrios up the valley in Naga district where the Project Impact experiment has now been under way for three years, there on the wall are pinned the sharp, clear words of Benjamin Franklin:

*"Industry: Lose no time; be employed
in something useful; cut off all unnecessary actions."*

Well, well. It's one thing to preach, another to practice. In the 80 years since Rizal died before a Spanish firing squad, the youth of his fatherland have multiplied four or six times over, and conditions in many parts do not encourage serenity. There is work enough to do, especially in rural areas like Naga where you may grow three crops of corn or rice a year in the valley, and where there is tobacco or ipil-ipil trees to tend on the terraced hills. But there's often a conflict for young people between work in the soil and attendance at school. If they had to decide which were the "unnecessary actions" they should cut off, these were usually school classes. Helping the family to harvest or plant or keep house was not just something useful; it was survival. In the Naga schools, like nearly anywhere else in the Philippines, about half the primary school age children have "dropped out" before reaching Grade 4 because of irregular attendance.

Not that the present school system could handle much larger numbers. It is said that about 85 percent of the recurrent budget for education goes to

pay the salaries of the country's 400,000 teachers and, with 12 million pupils now enrolled in primary and secondary schools, that gives a teacher: student ratio of 30:1. They would be exceedingly crowded classrooms if student numbers increased, and there is not money for more teachers. What will happen in the year 2000, when the country's school-age population has doubled again?

The same question faces other countries in Southeast Asia. In Indonesia in 1972 there were 13 million children enrolled in primary schools, and no places for another 7 million of the same age group. A big effort in primary school construction has partially closed the gap since then, but by 1979 there will be 24 million children in the 7 to 12 age group. How can one train and pay for all the extra teachers?

This was the sort of question that the Southeast Asian Ministers of Education Organization pondered in the early 1970s. SEAMEO turned in 1972 to one of its regional centres, INNOTECH, the Regional Centre for Educational Innovation and Technology, with a request to do detailed research on "The Development of an Effective and Economical Delivery System for Mass Primary Education". What the education ministers wanted was an alternative to the present costly and (in terms of excluding out-of-school youth) rigid system; yet an alternative that could grow up alongside the present school system, as a supplement to it rather than a total replacement. As Dr Santoso Hamijoyo, director-general of primary and secondary education in Indonesia, has said: the present school system with all its pitfalls has taken root for decades, and it would be "unwise and technically impossible, and perhaps also socially unacceptable, to change this overnight."

The emphasis, then, was on finding ways to introduce as much flexibility as possible into the learning process and to maintain quality while making primary education available to almost everyone. Also to keep within the bounds of limited national budgets. It was a tall order. How do you set out to achieve better learning results for a larger number of students at a greatly reduced cost per student?

INNOTECH's answer was to suggest a system that drew on all the resources of the community. That is why the research was named Project Impact, standing for Instruction Managed by Parents, Community and Teachers. Proyek Pamong is the Indonesian equivalent. Yet it was not only parents and community leaders and skilled craftsmen who were to back up the teachers, but the older students as well who should play the role of tutors and thus allow the professional teachers to spread their energy and time among many more pupils. Also the children should do as much learning as possible

by themselves, singly or in peer groups. Which is the reason for a big effort in rewriting the entire school syllabus in "modularized" form, so that a student can use these booklets as building blocks and go through the year's curriculum in his own time and at his own pace.

Finally, the INNOTECH planners argued that the research, at any rate in the first phase, should be done in rural districts, among a cluster of villages. This was for the good reason that the vast majority of people in Southeast Asia still live in rural areas. Also, I suspect, they thought there would be more community support in long-



Self-reliance among the young: Lucita, the youngest instructional aide at Naalad, marks a post-test that Minie Abangan has just done by herself on completing a module. By correcting all the post-tests, Lucita frees a teacher/IS for other work.

settled villages than in the more restless areas of mushrooming cities.

With strong support from the Indonesian and Philippines governments, a search was made for suitable rural areas. The people of Kebakkramat district, 15 km east of Solo in central Java, and of Naga district, 20 km south of Cebu city in central Philippines, responded positively to an acceptance campaign when the experiment was outlined to them towards the end of 1973. IDRC supported the project with a grant to INNOTECH.

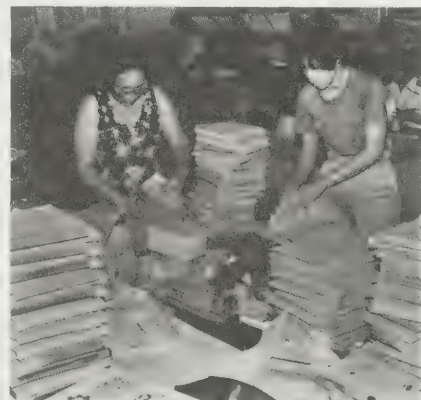
The mood was one of adventure. Dr Liceria Soriano, now director of INNOTECH but who was then Director of Public Schools in the Philippines, went to Cebu and ended a speech of advice and encouragement by quoting the words of André Gide: "One cannot discover new oceans unless he has the courage to lose sight of the shores." An apt metaphor to use in a city near where Ferdinand Magellan ended his days.

How has Project Impact's voyage of exploration fared in these three years? Well, there have been stormy times, and equally some periods of being becalmed. But enough progress has been achieved to make talk of "new oceans" more than a brave rallying-call. Dr Soriano says today: "I feel very

much encouraged to go on with the project. Many of the obstacles that were met at the beginning are now overcome. There are a few more difficulties that we must solve, but I know that our experiences in the first phase of the project will help us to do better in the second phase."

The module-writers both in Cebu and in Solo (where they are known as subject specialists) have laid the foundations for this progress. It has been unremitting work, turning the seven or eight subjects in the curriculum for Grades 4 to 6 into easy-to-read booklets, each of which takes an average student two to four hours to master. The tendency at first was to write too many booklets but, by eliminating repetitive matter, the Cebu team has kept each subject inside 25 modules for the year's curriculum, plus five review modules. Nevertheless, that means at least 210 booklets, each complete with readiness tests and post-tests, for a pupil to work through in a year. No wonder that in large letters on the outside wall of the Naga schools is written the admonition of Dr Narciso Albarracin, who is both Under Secretary for Education and chairman of the national steering committee for Project Impact: "The core of our school curriculum is work!"

Whether it is the influence of Dr Albarracin or Benjamin Franklin, work they certainly do. A visitor is always impressed to see how intently the children are studying their modules, unsupervised for the most part. In the Naga barrios they are clustered under the shady "learning kiosks" built by the community; in the Indonesian villages they more usually sit on the cool stone against the outside wall of the school building. The schools themselves have been transformed, by removing inside walls and adding lines of bookshelves, into Community Learning Centres. The physical changes are striking, but it will take longer for attitudes to alter so that all the people in the village think of it as their place, rather than as a school.



To keep pace with the pupils' demand for more modules, the production unit at Cebu College has to be full of fast workers with nimble fingers. Collating by hand is a heavy task here.



Dr. Soriano, director of INNOTECH: Many of the obstacles that were met at the beginning are now overcome.

The greatest change, perhaps, has happened to the teacher. Classroom teacher no longer, in fact, but Instructional Supervisor organizing the non-professional assistants, whether high school students doing (as in the Philippines) one full day's tutoring a month or (as in Indonesia) home tutoring in the evening at a neighbour's house. The is also has the job of training the older primary students (Grades 4 to 6) in a programmed manner so that they can, the next day, pass on a lesson in reading, writing, comprehension or mathematics to children of the first three grades.

There are, in Dr Soriano's words, "a few more difficulties that we must solve." One of them is the problem of strengthening this programmed teaching in the lower grades, perhaps through a professional teacher (not one, however, who's been retrained as an is) working to give them a sound basis in a second language so that by Level 4 they can learn rapidly on their own. Both Naga and Solo were chosen because the mother-tongue (Cebuano and Javanese) is different from the language of instruction in the later grades, and INNOTECH wanted to devise a system that would include an effective approach to this common problem of transition between languages.

The results of tests, made to compare the work of Impact students with those in non-Impact schools, show that the former with few exceptions have scored higher marks. Rosetta Mante and Boorham Respati, the two project directors, will hasten to add that these tests are still preliminary; but it is encouraging that the Impact/Pamong students are even now scoring at least 6 percent higher marks than their contemporaries.

The project has also had some success with those who would normally be called out-of-school youth, both by keeping in this more flexible system those who would have by now dropped out of school through irregular attendance, and by drawing back those who years ago left primary school without



Peer group learning at Alastuwo centre is done mainly in the cool of the verandah outside the school, while the building itself is now mostly used for library and administrative purposes.

graduating. I think of Exequiel Sobramonte, who had to be absent for a month on family duties (his parents were visiting another island) but who caught up on their return by speeding through 17 nodules in one week; and also of Sukiyo and Sugiman, two grown men who came back to a village "learning post" and completed primary graduation to qualify for promotion in local government.

As for cost-effectiveness, the operating costs are likely to be significantly lower for a CLC than for the school it used to be. A Naga school with 10 teachers has been turned into a CLC run with only two instructional supervisors, a rural coordinator and an aide.

Even if a professional teacher is added, to work with the lower grades, and even if module production turns out to be marginally more expensive than textbooks (and it may not be — the unit costs during the research stage were bound to be higher than with a large printing), the Impact system will still be more economical than the traditional school in costs per student.

More figures on the learning- and cost-effectiveness will be available as Project Impact moves this year into its second phase. This involves trying out the system at two "replication" sites in the Philippines — in the nearby town of Lapu-lapu and at Sapang Palay near Manila, where Tagalog not Cebuano is the basic language. It also involves

bringing the experiment at Naga and Solo full circle by 1979, when every grade (or level) of primary student will have been affected by the system.

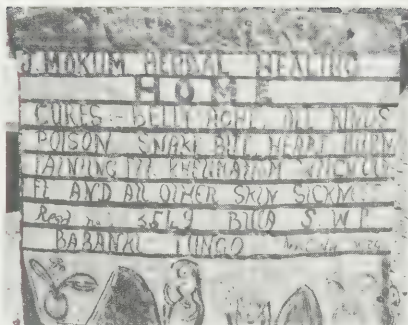
Every day, as they come to work at Cebu State College, the module-writers for Naga pass by Rizal's statue. They are not accustomed to holding their heads high, in the poet's phrase; most of the day they are bent busily over their books. But I trust they straighten up with a feeling of satisfaction now and then. Together with the iss, who have adapted so well to their new role, and the 2000 or so students in Naga and Solo who have taken enthusiastically to the experiment, they are proving to be a "fair hope" for Southeast Asia. □

Clyde Sanger is the author of a booklet, soon to be published by the IDRC, which describes the origins and development of Project Impact, a new approach to mass primary education in Indonesia and the Philippines. A journalist and author, Mr. Sanger is an associate director in the IDRC's Publications Division. He visited several of the rural schools participating in Project Impact early in 1975, and again at the end of last year.

MEDICINE

The best of both worlds?

Jean-Marc Fleury



"During evening visits in African hospitals, the relatives of the sick often bring them remedies recommended by healers. They do so at the request of the patients, who then take the medicine without the knowledge of their physicians. I know it goes on," states Professor Mamadou Koumaré, a specialist in toxicology. "I have had to conduct studies on poisoning resulting from the interaction of the various medications prescribed both by the healer and the physician."

This "internal" conflict between traditional and modern medicine, described by the director of the National Institute for Research on Pharmacopedics and Traditional Medicine in Mali, is only one indication of a fundamental debate which threatens to shake up the medical establishment in many black African countries.

African leaders recognize the existence of the two medical systems in their countries. First, there is modern medicine, a Western import, complete with its own variety of hospitals, physicians and Western techniques. Then there is an immense parallel system which also has its therapeutic groups, healers and rites. This is traditional African medicine, and 90 percent of the Mali population continue to trust in it. Stresses Professor Koumaré, "The other 10 percent use the hospitals, but take the healer's remedies too."

In the view of scientists like Mamadou Koumaré, governments should not continue ignoring traditional medicine, if only for the well-being of the patients who endure the intestinal side-effects of this medical controversy. "Folk medicine" must be re-examined, and every effort made to utilize its potential. This need was underlined by the most recent session of the African Regional Committee of the World Health Or-

ganization, which dealt with "Traditional Medicine and Its Role in the Development of Health Services in Africa". Participants recommended that each country in the African region adopt a dynamic policy designed to re-establish traditional African medicine.

The growing interest in traditional medicine stems from several factors. First of all, traditional medicine is of necessity the choice of the majority of the population. "A man with a monthly income of 1,500 CFA francs whose physician writes him a prescription costing 2,000 or 5,000 francs, simply has no choice," explains Prof. Koumaré. "He disregards the prescription and goes to see the therapist." Secondly it seems impossible in the short term that modern medicine can be made available to all, particularly to rural populations in Africa. It simply costs too much. Finally, it is generally agreed that Western psychotherapy is not readily adaptable to other socio-cultural settings.

The Government of Zaïre is in the forefront of this return to grassroots medicine. With the support of the IDRC, it has initiated an important research program to study the potential of traditional medicine. It has even created a new department for "healers' medicine" within Zaïre's National Research and Development Board.

Gilles Bibeau, an anthropologist retained as a project consultant by the IDRC, explains that the new department is subdivided into five sections responsible for botany, pharmacology, ethnomedicine, psychopathology and anthropology.

The first two sections record and analyse the medicinal plants used by the healers. Construction of a herbarium containing 5,000 plants is plan-

Jean-Marc Fleury is a science writer with the IDRC's Publications Division. This is one of a series of articles written following a recent visit to IDRC-supported projects in a number of West African countries. The article originally appeared in French in Le CRDI Explore, Vol. 6 No. 1.

ned. The ethnomedicine section conducts exhaustive studies of the causes of diseases and the effectiveness of traditional treatment. The section includes a team of specially trained researchers scattered across the country. Each establishes direct contact with a number of healers and observes their routine. When a healer treats a patient suffering from asthma, for example, identified by a term in the healer's vocabulary, the researcher notes the healer's diagnosis in this same vocabulary, and records details of the therapy administered. He then asks the therapist to explain the causes of the disease in his own words, and lastly, he questions him about his concept of the respiratory system and his interpretation of the special disorders caused by the disease. All the healer's observations as well as the scope and context of his therapeutic practice are duly recorded. "This has never been done before," explains Gilles Bibeau, "because it was simply accepted that African medicine was not scientific."

About a dozen physicians are working in close association with the healers to assess the effectiveness of traditional treatments. A neuropsychiatrist, for example, is working with five healers specializing in psychological disorders. When a patient suffering from epilepsy appears for consultation, the physician records an electroencephalogram. However, he leaves it up to the healer to make his own diagnosis and apply his own form of treatment in its entirety. From the beginning to the end of the treatment, physician and healer make their diagnoses independently. Everything is designed to leave the traditional therapist free to practice his form of the healing arts. The diagnoses and methodologies of the two doctors are then compared to determine the degree to which they are consistent.

The fourth section of the project deals with psychopathology. Such studies have assumed great interest since most of the specialists working in this area recognize the success traditional African medicine has achieved in the treatment of psychological disorders. Ellen Corin, a consultant psychologist working with IDRC on the project, has studied many of Zaire's therapeutic rites, including the widely practiced Zebola rite.

In Kinshasa, the capital, people from all walks of life consult groups of healers for Zebola therapy. Ellen Corin explains that these people rarely find relief through Western psychiatric treatment, but the type of therapy offered within the Zebola community often succeeds. Most of the Zebola patients are either wives of government officials or students who experience severe difficulty adapting to city life.

The fifth section of the project, anthroposociology, studies the relationship between the healers and their environment. To find out, for example,

if it is true that the healers within one ethnic group refuse to treat the sick belonging to another group. A study of the number of healers practicing a particular specialty has also been undertaken to provide a graphic outline of the services provided to the people by this parallel system of medicine.

This outline includes hospital villages such as Mbindo Lala, deep in the Zaïrean bush, where the village chief and his wife are specialists in the treatment of psychological disorders. Although Mbindo Lala looks like any other village, it functions purely as a hospital. It regularly caters to 30 to 50 patients, often accompanied by their families. Many are incurable and have lived there for a number of years; their families effectively form a therapeutic community where a normal village life can flourish. In this way the patient maintains contact with everyday reality, and has no need for a readaptation program once he has been cured.

The project has 25 researchers located in as many regions. Each will submit a brief report on some 40 healers, and study the activities of 10 or 12 of them in more detail. Next December, at the conclusion of the project, 1,000 healers will have been studied, 250 of them in detail, and files will be available on some 10,000 patients treated by traditional healers.

The team's research to date confirms findings from previous studies — Western psychotherapy is inappropriate to African life. Ellen Corin believes it is necessary first to study the healers, then to try to develop innovative approaches and treatment techniques from their methods. But reform must not end there. In terms of traditional therapeutic groups like the Zebola, Ellen Corin proposes a basic principle: "The effec-

tiveness of the rite cannot be isolated from the environmental conditions in which it is practiced." So these rites should be encouraged and fostered as such, rather than absorbed within existing hospital structures. "This means the government must create the means whereby healers may consult physicians, and vice-versa," maintains Mrs. Corin.

Gilles Bibeau is similarly concerned that a rural hospital like Mbindo Lala may form part of a system rejected by an Africa that is becoming increasingly Westernized. "However," he states, "Traditional medicine is not static. It is continually evolving, developing, progressing." Some healers, for example, have succeeded in transposing the village community hospital concept into an urban setting.

According to the anthropologist, the government must begin to assist the healers. It should assume responsibility for hospitals like Mbindo Lala, improve hygiene, and make drinking water available. Professor Koumaré is also an enthusiastic supporter of an assistance program for healers and, on his recommendation, the Mali government created two branches in the Public Health Department: one is responsible for modern medicine, and the other, under his directorship, is devoted to traditional medicine. Professor Koumaré feels it would be misleading to consider integrating the two approaches. They are too different. "The governments must," he says, "support two parallel systems which interact and co-operate, yet retain their own special features."

This may indeed prove difficult however, for it has been said that two differing entities cannot exist indefinitely in the same milieu. One always absorbs the other eventually. □



Professor Mamadou Koumaré (left) is responsible for the traditional medicine program within Mali's Public Health Department.

Throughout much of rural Asia the village midwife is an influential member of the community. Her clients are also her friends and neighbours, and when she is not assisting at the birth of a child, she works alongside them in the fields. With her accumulated knowledge of traditional lore and folk medicine she has a definite influence on the health of the families she serves — although, lacking formal education or training, that influence may not always be positive and her efforts not always successful.

Three years ago the IDRC co-sponsored a seminar for health planners from Indonesia, Malaysia, the Philippines and Thailand that examined the future of traditional birth attendants (as the health professionals prefer to call them), and particularly their potential role in family planning programs. Delegates reported on what was already being done in their countries, and concluded that there would continue to be a role for the village midwife in the foreseeable future, but there was an urgent need to provide more training programs, particularly if they were to take on the additional role of family planning motivators.

Dr. J. Y. Peng, formerly with the World Health Organization and now Population and Health Sciences representative at IDRC's Asia regional office, was a member of the advisory group to that seminar, and co-editor of the report subsequently published by IDRC (*Role of Traditional Birth Attendants in Family Planning*, IDRC-039e). He reports on developments in the four countries since the seminar took place.

In **Indonesia**, where an estimated 80 percent of all births are attended by traditional midwives, a total of 34,110 midwives had been trained by the end of 1976 — 10,000 of them in the past year alone.

The program is part of the Ministry of Health maternal and child health program, in cooperation with village heads, who keep a register of all midwives who have completed the training. The initial course lasts about two weeks, and is followed by six months of once-weekly sessions, at the end of which the midwives undergo an oral certification exam. From then on they may attend weekly refresher courses and workshops.

They learn about hygienic delivery, mother and child care, and family planning, and keep accurate records of births and deaths. A handbook has been produced to assist Ministry of Health workers who supervise the midwives. It has been found that the midwives' success as family planning motivators depends to a large extent on the guidance given by the health professionals. The average number of family planning acceptors recruited by the midwives has been two to three per month.

Village midwives deliver

J. Y. Peng



Traditional midwives taking part in a training course in Malacca, Malaysia.

The policy in the **Philippines** is to attempt to integrate the newly trained traditional midwives into the overall health care system. Up to 1974 some 9,200 had been trained by the government program, but since then the effort has been greatly stepped up, and the target for 1977-80 is 5,000 per year. As part of this increased effort the Instructor's Guide has been up-dated and now includes training on family planning, and new teaching materials have been developed.

With IDRC support a research project has been carried out, using active trained midwives to supervise others, and has met with considerable success. As in each of the other countries, the traditional midwives were found to be

quite successful as family planning motivators at first, but their success tends to decline with time.

In **Thailand** also the training of traditional midwives has been increased in recent years. Following a successful IDRC-supported project to involve traditional midwives in family planning (see *IDRC Reports* Vol. 5 No. 1), a training program was begun to provide more trainers at the provincial level. This will be completed in 1977, and it is estimated that as many as 45 percent of traditional midwives will have been trained in family planning and maternal and child care in the next two years. This program may be extended to 1980 in order to reach all available traditional midwives.

It is expected that the trained midwives will spend up to half their time on family planning activities, and some excellent visual aids and motivation kits have been developed to assist them in their work.

Malaysia has the smallest number, about 3,000, of traditional midwives of any of the four countries, and by the end of 1976 more than half of these had passed through the government training courses — 1,645 in all. The National Family Planning Board has begun a special program to train selected village midwives in family planning techniques. This program has gradually expanded, and by 1976 some 280 midwives had been trained for the project and another 168 were undergoing training.

Studies have also been made of the traditional midwives' success as family planning motivators and of their caseload. These studies showed that, while the number of clients increased with time, the number of family planning acceptors recruited by each midwife declined over the same period, averaging out at about two per month.

In general, then, all four countries have made a determined effort to better utilize the services of traditional midwives by involving them in the overall health care system. The key factors in such programs are training, the assignment of definite functions, and good supervision.

It is generally accepted that the traditional midwives are gradually fading out, to be replaced by trained, graduate midwives as government health services improve and expand. Thus their role is essentially a transitional one — but it is a role that will continue to be important, especially in rural areas, for many years to come.

As one of the participants in the 1974 seminar put it: "The question is no longer whether they are trainable, changeable and utilizable. Rather the question is how best to train, how best to supervise, how best to utilize, and for what purpose." Indonesia, Malaysia, the Philippines and Thailand have gone a long way toward answering those questions in the past three years. □

The need to find ways to ensure that all people have adequate supplies of food is one of the most pressing problems facing the international community today. On the following pages, a series of six articles that examine some very different aspects of the global food situation, and what can and is being done to improve it.

DOSSIER:
FOOD



Photo: Jaime Rojas

Time for a fair deal for farmers

W. David Hopper

There was no global strategy to conquer hunger when the World Food Conference was held in 1974. There is still no strategy. Worse, there is no effort to produce one, IDRC President Dr. W. David Hopper pointed out when he delivered the annual J. S. McLean Memorial Lecture at the University of Guelph.

He noted, however, that global strategies are being discussed in such fields as nuclear energy, the environment, smallpox eradication and monetary affairs, and added that it is possible to focus on the outlines of such a strategy for world food problems.

Dr. Hopper said that agricultural development rests on three legs: farm technology, economic incentives, and supply and market structures. Following are his comments on the economic incentives that would make farmers risk the adoption of improved farm technology.

points to a singular failure in nearly all less-developed countries to adopt policies that provide an incentive for agricultural innovation and modernization.

The spread of high-yielding varieties in some parts of Asia, Latin America, and Africa has demonstrated to even the most confirmed skeptics that farmers will respond to personal economic opportunity if the price ratios and profit margins are attractive. They seldom are. The economic climate for the so-called "Green Revolution" in Asian grain production in the late 1960s was set by highly remunerative prices for farm output and low prices for fertilizer, irrigation water and other inputs. The ratios of prices paid to those received gave a strong encouragement for farmers to produce to the maximum capacity of their land. This structure of incentives followed several years of production shortfalls due to fickle weather. But as soon as the granaries began to fill again, the role of incentives in agricultural progress was forgotten, and public policies stressed, as they had in the past, the provision of cheap food for the urban consumer.

There seems little doubt that even if new, high-yielding varieties of wheat and rice had not been available to launch a green revolution, grain output would have risen in Asia as the rains returned, on the basis of the strong pull of profits from food cultivation alone. The reversal of incentive policies following the jump in the growth of output in the late 1960s contributed to a drop in this growth and provided powerful evidence that the supply function for food in the developing nations is responsive to price and profit changes. When new technological opportunities are added to an attractive structure of economic incentives, the traditional rural economies of the developing nations suddenly become alive and suffused with the ferment of change. This is most disturbing to those who argue that developing-nation farmers are stubbornly resistant to innovation, requiring either a sweeping social revolution or the passage of generations to alter significantly their patterns of economic behaviour. It just isn't so. Today, we can cite an overwhelming array of examples from all parts of the world to prove the contrary.

National economic policies for fostering agricultural progress are obviously a matter for the sovereign decisions of individual countries. But there is an overwhelming body of evidence that

If the farmer is responsive to economic incentives, then the logical question is why are incentives neglected, especially in the face of significant food deficits in so many countries? It is not an easy question to answer. The majority of developing-country governments seeks the rapid modernization of their societies and economies, but most conceive of modernization as consisting of manufacturing industries and the physical elements and services associated with industrial-urban growth. The rural sector is regarded as the "traditional" economy from which will come labour for industry, renewable raw material commodities for processing or export, and cheap food for a growing urban proletariat. In this vision, the rural economy is a supplier of resources, it does not compete for investment allocations with the urban, industrial, or other "modern" sector infrastructures. The exploitation of the rural economy to build a modern urban-industrial economic base has long been a theme of the literature on economic development; it has an honoured history in the experience of Western industrial history in the experience of Western industrial nations; and it is hard to envisage an alternative in a world where external aid is meagre relative to need, and the material expectations of newly sovereign peoples place heavy and insistent pressures on their governments to build national industrial capacities that will open non-farm job opportunities and assure an ever-growing supply of industrial produced goodies for consumption.

If overall economic development is to be based on the exploitation of the farm and rural economies, it is hardly surprising that both investment finance for agriculture and incentive policies for greater farm production have little place in the plans and programs of Third World nations. Of course, there is always a part of any national economic plan devoted to the importance of agriculture and the rural economy — no politician can ignore the 60 to 80 percent of the population living and working in the rural regions of the nation. But aside from its prominent position as the third or fourth chapter in the plan document and the always careful assurance that agriculture and rural development have the paramount

call on the resources and talents of the nation, the implementation of this part of the plan invariably lags behind, often far behind, the efforts made on power, ports, steel plants, city expansion, and the many other aspects of a "modern" state.

The result after 30 years of building new countries, has been a failure of their agricultures to meet confidently and adequately the basic needs of their peoples. A development strategy based on the exploitation of the traditionally poor "traditional" sector has produced poor nations. The economic surplus of national rural hinterlands has fallen far short of what is needed to finance national aspirations for modernity. The bankruptcy of this exploitive policy is evident in the grim outlook for world food supplies in the next quarter-century. But this policy will likely not change, and, within the framework of the poor economies of the developing countries, cannot change, unless developed nations exercise greater assertiveness than they have in the past to direct a larger portion of their assistance to the support of agricultural modernization in Third World nations, and greater leverage on these nations to formulate and implement public policies that will encourage and reward farmer innovation.

A manifestation of the willingness of developing-country governments to exploit their own farm community for national development is the story of food aid, a story in which Canada plays and has played a prominent role. In brief, Canadian food aid, that is food purchased in Canada with money from CIDA for shipment to developing countries, has risen by over 19 percent per year since 1970. In 1976 it was approximately \$220 million or about one-quarter of all CIDA disbursements for international assistance.

Food aid shipped to countries or regions that are experiencing genuine famine emergencies is both necessary and laudable. Knowing this aid is or will be available should difficulties arise provides for low-income nations a sense of security against complete helplessness should disaster strike. And although this sense of security may be used by some governments to slight their own farm development with an untroubled conscience, this is not a valid criticism of emergency relief generously given by those who have an overabundance to those who are needy from events of tragedy. One cannot but be thankful that this nation can offer such succour; may we be able to do so in future.

But not all Canadian food aid goes to assist those in emergency need. Some of it is shipped as general economic assistance to poorer countries. The grain shipments are received by the aided government, sold to their local citizens through national marketing channels with the proceeds being used

to augment general revenues or for development projects agreed on between Canada and the partner nation. Seemingly a most sensible arrangement, using food grown in Canada, of which we have a surplus, as an external resource to help modernize a poor country. But who bears the real cost of the transfer? Someone must, for there is no free lunch even in a food-surplus nation. The Canadian taxpayer for one; they buy the grain. The Canadian consumer for another; they pay higher prices in Canada for the added market demand from CIDA. Most important for our purposes, however, is the cost borne by the farmers in the recipient nation; the price for their product is depressed by the foreign supply, a factor critical for incentive to innovate. The distribution of benefits, too, is interesting. These accrue to the Canadian farmer in the form of higher prices; to the urban consumer in the recipient nation in the form of lower prices; and to the revenues of the recipient country from the sale of the grain. In keeping with a policy of exploiting the rural economy as an avenue for development, the urban consumer is benefited by food aid at the cost of lower farm returns and sapped incentives for domestic production. In my view, our offers of food as general economic assistance carry with them an inherent threat to the building of a viable agriculture in the developing regions of the world.

Economic incentives for the families who produce the world's food and on whom agricultural progress rests are a much neglected part of an overall strategy for expanding global food production. They must receive attention in the future, and Canada, as a food-abundant nation, must be careful that its actions, however well and generously motivated, do not erode or destroy these important forces for innovation and development. □

The School of Agricultural Economics and Extension Education, Ontario Agricultural College, University of Guelph, hosts the annual J. S. McLean Memorial Lecture. Dr. Hopper's lecture has been published in IDRC's monograph series under the title Canada's Role in World Agricultural Development (IDRC-085e) and is available on request from the Centre's Publications Division, see p. 23 for details.

One good harvest is not enough

Ernest Corea

A plenteous harvest had strained the storage capacity of the Food Corporation of India, it was reported earlier this year. Some 8 million tons packed the FCI's warehouses full. Another 5 million tons were stored in the open, with a protective covering of polythene. This portion of India's grain stock required regular fumigation and aeration, at considerable cost. The FCI hired privately-owned warehouses to store 5 million tons more.

In Sri Lanka, the chief administrators in each province met in February to plan an unusual exercise: ensuring that the heavy harvest presaged by copious green stalks of paddy blowing gently in the wind should be adequately stored and speedily distributed to non-producing areas.

Nevertheless, the adequacy of food supplies over the long term in both countries is fraught with uncertainty. Indeed, this assessment could be applied to many developing countries, where good harvests have been recorded from time to time, but where many people remain underfed and malnourished.

The contrast between apparent plenty — as evidenced by an eye-catching bumper crop — and actual want in some developing countries is a timely reminder that one good harvest or two do not automatically wipe out a food deficit. The road to plenty is long and difficult.

A food deficit is defined as the difference between anticipated cereal production, based on known production trends, and increased demands for food, resulting from higher population and increased per capita income.

Thus, eliminating food deficits is a long-term process; a few exceptionally good harvests can only offer a country passing relief — and perhaps complicate the food supply situation by raising expectations that may not be fulfilled, come next harvest time.

The adequacy, or inadequacy of food supplies in any given country has to be assessed against a number of interlocking factors such as population, income, transport, storage, distribution, and social expectations. An adverse change in one or more of these could minimize or even cancel out the benefit of a good harvest. Thus, effective food strategy — global, regional or national — has to be a combination of many activities, all directed at the overall objective of improving the human condition.

An important prerequisite of multifaceted approach to food, is that world food trends should be monitored, and that policies and practices which affect these trends are studied, analyzed and made known. In 1975 the International Food Policy Research Institute (IFPRI) was established to conduct research on policy problems affecting production, consumption, availability, and equitable distribution of food in the world. The world's poorest countries are a special focus of IFPRI.

The Institute was established as a result of a recommendation made by the Technical Advisory Committee of the Consultative Group on International Agricultural Research, and is funded by the IDRC, the Ford Foundation and the Rockefeller Foundation.

It is governed by an international Board of Trustees, which is chaired by Sir John Crawford of Australia and includes seven members from developing countries. IFPRI's first director is Dr. Dale E. Hathaway.

The Institute's research program covers four areas:

- An analysis of world food trends and the basic factors underlying them;
- Policies that influence the rate of technological change, investment and resource productivity and thus, the food production potential in developing countries;
- Policies that affect the total availability and distribution of food between and within countries;
- Policies that affect the trade and concessionary food aid flows of significance to developing countries.

IFPRI's studies to date¹ suggest that there is as much need now for a concerted global effort to increase food production as there was at the time of the headline-catching World Food Conference of November 1974 — despite relatively good harvests in 1975-76 when world grain production was 1,216 million tons — 30 million tons more than in the previous year. This was lower than the 1973-74 world figure, however, and some 63 million tons below long-term production trends observed during the preceding 15 years.

The 1975-76 harvest in developing (market economy) countries was 30 million tons over the previous year, and about 10 million tons over long-term

trends. Further increases were expected in the 1976-77 harvest.

While these figures are encouraging in absolute terms, IFPRI's analyses show that without a major, indeed, unprecedented increase in cereal production, developing countries could be 100 million tons short by 1985. To put the situation in perspective, IFPRI has pointed out that the possible shortfall of 100 million tons "compares with a shortfall of 45 million tons in the crisis period of 1974-75, and an average shortage of 28 million in the relatively good production period 1969-1971."

The figure of 100 million tons is based on a projection of the production trend of 1960-1974, an average increase of 2.5 percent a year until 1975. But, IFPRI reports, "during the last half of that period, 1967-74, the production growth rate has slowed to 1.7 percent." If future production follows the lower, and not the higher, trend, "cereal production could fall short an additional 100 million tons, doubling the deficit to 200 million tons."

The way out of this probable nightmare is to increase production more rapidly, says an IFPRI report. Avoiding the 100 million deficit "would require increasing the production growth rate from 2 percent a year to almost 4 percent. To approach this goal would require very substantial increases in investment in resources devoted to food production and a greatly improved agricultural performance in the countries concerned. This will not be possible without heavy transfers of capital and technology from developed countries."

This is not a doomsday warning. It is a warning nevertheless, and one that deserves single minded attention by policymakers, scientists and all others who realize that food deficits mean more than statistics... they mean continuing hunger and malnutrition for underprivileged people. □

Ernest Corea is associate director in charge of public affairs in the IDRC's Publications Division.

¹Research Report No. 1, February 1976 — Meeting Food Needs in the Developing World: The Location and Magnitude of the Task in the Next Decade.

Current Food Policy Report No. 1, March 1976 — Grain Supply and Policy Developments. 24th PAC Session, New York, 31 January - 4 February 1977 — Recent and Prospective Developments in Food Consumption: Some Policy Issues — Draft report prepared by the International Food Policy Research Institute.

Fishing for development

J. H. Hulse

Farmers, villagers, students, even members of a youth club are reaping a rich harvest in rural India these days — a harvest of fish.

Fish farming, or aquaculture as it is scientifically known, has been practiced in India and other parts of Asia for centuries, but the annual catch from traditionally managed ponds has been low. Now a remarkably successful project run by the Central Inland Fisheries Research Institute of India is showing rural people how to vastly increase fish production with very little effort.

Traditional fish farmers cultivate only one species in each pond, and take an annual catch of about half-a-ton from a one hectare pond. CIFRI researchers were able to produce ten times that amount from the same size of pond by cultivating five or six fish species with different feeding habits under controlled conditions at the Institute's headquarters in Barrackpore.

With the support of an IDRC grant, the Institute sent out a team of researchers to relatively remote villages of Orissa, West and North Bengal to put their findings to the test and see if the results obtained with composite fish culture (polyculture) under experimental conditions could be duplicated by local people using village ponds.

One particularly outstanding feature of the project is that CIFRI has elected to work with communities that have had little previous exposure to scientific fisheries. It is therefore all the more remarkable that they have responded so enthusiastically. The owners of the pond, whether they be cooperative or private farmers or institutions, are responsible for all inputs including stocking, fertilizing, and general pond management. The CIFRI staff provides the scientific service free of charge and remain essentially in charge of each new participating pond for the first year, after which the owners carry on and the CIFRI staff simply stand ready to give technical advice as it is needed. At the end of each year, the CIFRI staff will move on to a new set of villages.

Biraharekrishnapur Village, close to Puri, Orissa, has three ponds that were used originally for drinking water, personal washing and laundry, in addition to some fish farming. Sri B. Mrisa, the President of the Village Council, states that before polyculture was introduced, the value of the fish harvested was about 1,000 Rupees (\$125) per year. During the first year of the polyculture system, the value of the fish harvested was over 22,000 Rupees (\$2,750) from the three ponds!

Before stocking the ponds were cleared of unwanted fish by an interesting locally developed process. They were treated with an oil cake (the residue of an oil seed from which the oil has been extracted) known locally as Mahua. This oil cake contains a saponin, Mowrin, an alkaloid which is highly toxic to most fish, molluscs and other unwanted pond life. The particular advantage of the process is that the effective toxin undergoes biological degradation within about 10 days.

More fish means a better diet for the rural people, especially the children.



The ponds were then stocked with the three main Indian carp Cattla, Rohu and Mirgal, and the exotic Silver, Grass and Common Carp. Cattla and Silver Carp are surface feeders, Rohu is a column feeder, and the Common Carp and Mirgal are bottom feeders. The ponds were fertilized with cowdung, urea and super-phosphate once each month.

In the Puri area, a farmer accepted the demonstration of polyculture for one year. During this one year his cash return from the farm was more than four times what he had realized from the traditional system and he is so impressed with the polyculture system that he is using the entire proceeds of his first year of sale of fish to lease three more ponds and to dig a fourth pond for polyculture.

One particular area of interest is a 140 square kilometre green belt, about 20 km outside of Calcutta which has a population of around 140,000 people, and a great many village ponds. The activities in this region began with lectures to the local village leaders and community workers on the basic technology and potential benefits of polyculture. Nine villages in the Hanstukur Bishnupur region with 28 composite culture, nursery and rearing ponds were visited.

It is interesting that six of those cooperating in composite culture and/or nursery and rearing ponds are institutions, including, at one end of the scale, the students of the Indian Institute of Management, and at the other, a Child in Need Institute, a charity hospital. Others include a village youth club, and a high school operated by the Church of North India, where aquaculture is now included as a formal subject in the curriculum.

The students of the Indian Institute of Management are operating several ponds as a part-time exercise, including one of the largest ponds in the program covering about 1.2 hectares. From their first year's profit they are now testing a particularly difficult new pond which, because of local deposits of ferric oxide, has an unacceptably high acidity level. The students, with the aid of CIFRI, are now exploring a complex system of compost and soda ash treatment to reduce the acidity to an optimum level. They also propose to tackle a 5 hectare pond which presents major difficulties in terms of eradicating the existing unwanted species. The students are beginning by intensively fishing and dragging this large pond and will then explore the ability of comparatively large fingerlings from the five carp species to survive and dominate the pond's population.

One of the local farmers is exploring an integrated system of composite aquaculture together with rice and cattle production. He uses the cowdung to fertilize the ponds as prescribed; as feed he uses a mixture of rice bran and

groundnut oil cake which is immersed in the ponds in hanging baskets; and he pumps some of the water from the ponds to irrigate his vegetables. He and others are successfully using waste cauliflower leaves during the winter season as a feed supplement for the Grass Carp.

A few of those who are cooperating also appear to be having some success with a compost made from water-hyacinth which chokes many of the ponds and waterways of Asia. The compost is made by burying the harvested water-hyacinths (*Eichornia spp*) under a layer of oil cake, ammonium sulphate and super phosphate. After seven days the compost is scattered onto the ponds.

The Siksha Sancha Mission School run by the Church of North India made more than 20,000 Rupees from their fish pond during the first year. Some of the other cooperators are now including a hybrid carp from Rohu and Catla which carries a much higher proportion of edible meat than its parents. It also appears to show some measure of hybrid vigour in its rate of growth. A number of shallow ponds are used at first for culturing carp from spawned fingerlings and subsequently for the air-breathing catfish locally known as Magur (*Clarias*), now being introduced into the polyculture system. The breeding of the carp takes place during July and August after which the catfish are introduced. CIFRI considers that in shallow ponds, yields of 3 1/2 tons of catfish per hectare is not an unreasonable target. One pond, stocked nine months earlier, was dragged recently and produced Grass Carp ranging in weight from 2.7 to 3.4 kg, Silver Carp averaging around 2 kg, and Catla and Rohu both about 1.5 kg. This particular pond, which is half a hectare in area is expected eventually to become part of a dairy and poultry production complex with manure from the farm animals being used to fertilize the pond water.

The remarkably encouraging feature of the project is that most of those involved seem to be ploughing back their profits from the productive polyculture systems into other rural developments. For example, in Bira-harekrishnapur, most of the 22,000 Rupees received during the first year are now being invested in a village fresh-water drinking system. In the past, the village pond was the source of drinking water and washing water but it was clearly not very sanitary. Consequently, the President of the village and his rural community have decided to spend the money gained from the sale of fish to sink a 150 ft. well to pump up clean drinking water.

J. H. Hulse, Director of the IDRC's Agriculture, Food and Nutrition Sciences Division, travelled to several of the CIFRI project sites during a visit to India earlier this year.

Breakthrough in milkfish culture

Scientists at the Southeast Asian Fisheries Development Centre (SEAFDEC) in the Philippines have achieved a breakthrough that could be of major significance in increasing Asia's food supply.

They have, for the first time, bred milkfish in captivity by artificial fertilization. Artificial breeding could double milkfish production, greatly increasing protein supplies in Asia.

Milkfish are a favourite food of millions of Asians, providing as much as half the protein in the diet of people in the region. The success of the experiment is considered so significant that it was announced personally in Manila by President Marcos just days after scientists produced the first batch of artificially-bred milkfish.

Philippines Natural Resources Secretary, Mr Jose J. Leido Jr, added his view that the artificial breeding of milkfish "In the long run . . . will bridge the protein gap which accounts for massive malnutrition in developing countries."

Milkfish cultivation dates back at least 500 years in Southeast Asia, but traditional practices have improved little over the years, and still depend on primitive methods of capture of millions of fish fry from the sea, since the fish will not breed in captivity. These methods are uncertain (the catch varies from season to season and may be disrupted by events such as typhoons) and basically destructive, because they kill many other varieties of fish.

To overcome the shortage of fry for milkfish farming, scientists have been trying for many years to breed milkfish artificially — until now without success. The SEAFDEC team, under co-leaders William Vanstone and Einstein Lavina, were experimenting with a hormone extract obtained from the pituitary glands of the Pacific salmon by researchers at the Fisheries Research Board of Canada. Female milkfish injected with the hormone are stimulated to produce eggs, which are then fertilized by sperm from captive male fish.

On April 15 and 18, fish treated in this way produced eggs which were placed in a hatching system and produced fry 36 hours later. If this method can be standardized, the new breeding system could be used for mass production.

SEAFDEC's research program began in July 1975 with financial support from the Philippines government and the IDRC. Last year the IDRC made a grant to B.C. Research of Canada to develop a commercial system for bulk collection and preparation of the hormone gonadotrophin from salmon spawning in British Columbia waters.

Bringing in the fish harvest — polyculture results in increased yields and a renewed interest in fish farming.



Photos: J. H. Hulse

International centres play a vital role

Bob Stanley

In an age when confrontation and conflict seem too often to be the rule, the global network of international agricultural research centres is an outstanding example of what can be achieved through cooperation and collective effort.

Beginning with the establishment of the International Rice Research Institute in the Philippines in 1962, the network has rapidly expanded until today it includes nine specialized institutions stretching around the globe from Nigeria to Peru. Between them the centres employ several hundred of the world's leading agricultural scientists, and they provide training for many more.

Although each centre is located in a different country, and each specializes in a specific field of research, their testing and development programs are carried out in many countries, and their findings are distributed world-wide. The centres also share a simple common objective: the vital transformation of agriculture in the tropics and to bring about a better future for the subsistence farmers and their families.

Perhaps the most remarkable thing about the network is the way in which it is funded. Once IRRI, the prototype centre, had demonstrated its effectiveness, the need for other such centres was apparent. However, the set-up cost of between \$5 million and \$20 million,

and annual operating costs of around \$5 million each, obviously put such expansion beyond the means of the Ford and Rockefeller Foundations, which had taken the initiative in supporting the establishment of IRRI.

After considerable discussion amongst potential donors, the Consultative Group on International Agricultural Research was formed in 1971. This is a voluntary association of national governments, regional development banks, private foundations, the Commission of the European Community, and the IDRC. It is sponsored by the World Bank, the FAO and the UN Development Programme.

The five major developing regions of the world also participate in the Group, each sending an elected representative. The Group meets quite informally twice a year to establish priorities for funding new research. Members are free to provide funds for some centres and not for others — in fact no centre attracts funds from all donors. The Group is supported by a Technical Advisory Committee — an assembly of 13 eminent scientists and economists drawn from both developed and developing countries.

Much of the research supported by the IDRC's Agriculture, Food and Nutrition Sciences Division is related, directly or indirectly, to the work of these specialized international centres. Dur-

ing the past year the Division contributed some \$2 million to the centres in direct support of their projects, and considerably more than that to fund projects at the national and regional level that are linked to the work of the centres.

The newest member of the network is the International Centre for Agricultural Research in the Dry Areas, which was formally established last year with sites near Aleppo, Syria, and Tabriz, Iran. The centre will serve the last major agro-climatic region not previously covered by the network. The IDRC was a strong supporter of the new centre during the proposal stages, and has served as Executing Agency for the centre since 1975. The centre's acting director is a Canadian from the Prairies.

The IDRC also supports the international agricultural information centres that provide the network's vital communications links, and AGRIS, a computerized worldwide agricultural information system in which the centres play a vital role.

The work of the international agricultural research centres rarely makes headlines — good news rarely does. But for the rural peoples of the developing world they bring good news indeed: a sign that the era of neglect of the small-scale food farmer is at last coming to an end. □



IITA: International Institute for Tropical Agriculture
ILRAD: International Laboratory for Research on Animal Diseases
ILCA: International Livestock Centre for Africa
ICARDA: International Centre for Agricultural Research in the Dry Areas
ICRISAT: International Crops Research Institute for the Semi-Arid Tropics

IRRI: International Rice Research Institute
CIMMYT: International Maize and Wheat Improvement Centre
CIAT: International Centre of Tropical Agriculture
CIP: International Potato Centre

The farmer revisited

Gelia T.
Castillo

Farmers, the central figures in the complex drama of food production, are usually in the dark when any international conference on world food is held. If they are aware of such meetings, they may wonder why the experts and the policymakers were invited and they were not.

These sentiments bring into focus the human perspective from which Dr. Gelia T. Castillo, Professor of Rural Sociology at the University of the Philippines, approaches the problems of world food production. Dr. Castillo, who is an IDRC Research Fellow, views the farmer not just as a farmer, but also as a family man, a consumer and as a target of development programs. The view is important, she told a recent world food conference in the USA, because the farmer can make or break development programs — the success or failure of policies drawn up in the backrooms of government, or research perfected in laboratories and experimental sites, ultimately depends on the response of the farmer.

In the following extract from her paper, *The farmer revisited: Towards a return to the food problem*, Dr. Castillo assesses the response of the Filipino farmer to the new rice technology... "not as a universal farmer, but as an illustrative case."

Despite their poverty, their level of schooling, their small farms and share tenancy status, Filipino farmers have responded positively to the new rice technology. As a result, less than 10 years after the new technology was introduced, 62 percent of the total rice area in the Philippines is planted with modern semi-dwarf varieties.

Furthermore, annual output growth in rice production is explained almost completely by increased yield rather than by expansion in hectareage. Our farmers, therefore, cannot be faulted for being traditional, resistant to change and unwilling to take risks.

But all these innovations and improvements in productivity have yet to solve our rice problem. Actual yields still lag considerably behind experimental station potentials. As Dr. Robert Chandler, former Director of IRRI reflected on this matter, he said: "The only real disappointment I felt was that somehow we did not understand sufficiently why the Asian farmer who had adopted the new varieties was not doing better. Somehow I felt that the rice scientists who had obtained yields of up to 5 to 10 metric tons per hectare on the IRRI farm still could not explain why so many Filipino farmers (for example) obtained on the average less than one metric ton per hectare increase in yield after shifting from the traditional to the high-yielding varieties."

These observations have led economists and agronomists in several

national rice research programs, in cooperation with IRRI scientists, to study the bio-physical as well as socio-economic "constraints" preventing farmers from achieving as high yields on their farms as rice scientists have been able to obtain on experimental stations.

A study by R. W. Herdt and R. Barker identified two distinct gaps between farmer's yield and experimental station yield. "Gap I, the 'environmental effects', shows the difference between the maximum possible yield of the technology under experiment station conditions and the maximum yield in farmers' environments. The second gap shows the difference between farmers' actual yields and the maximum potential under their conditions... In some circumstances, the gap between the best yields in experiment stations and the maximum potential under most farmers' conditions may be just as wide as the second gap."

In farm level observations from this "constraints" study, mean yields were 2

tons per hectare during the wet season and 2.8 during the dry season. Heavy rains, floods, and typhoons caused low yields in the wet season, while in the dry season farmers attributed yield loss to rat damage, shortage of water, lack of fertilizer, insect infestation and weeds. The failure of the wet season crop also reduced the use of fertilizer, herbicides, and insecticides in the dry season.

Lack of awareness is not a significant constraint since 95 percent of the farmers have heard of the 16 practices studied. Inputs were also apparently available. The widespread adoption of the new seeds and their accompanying components has given us the impression that our farmers are sophisticated. Their ability to use each input correctly is, however, another matter.

For example, while most of the farmers had used chemical fertilizer for over a decade only one-third correctly identified the time at which it should be applied. Knowledge of correct weed control practice is also very low. While they use insecticides and can recognize the damage caused by insects, their ability to identify which insect is responsible for what damage is not as encouraging.

Although practically all of them use the new varieties, the seeds they use are seldom pure for they obtain them only from other farmers and they plant their seedlings much older than the ideal age.

We therefore have a situation characterized by high awareness of yield-increasing technology, and high adoption of that technology, but a low level of technical knowledge and consequently a high incidence of incorrect use of the technology.

Richard H. Bernstein, who surveyed rice farming in Central Luzon, suggests that "part of the yield gap could be reduced and costs could be lowered by teaching farmers how to use presently employed inputs properly." This latter task depends on the intensity of extension exposure. Unfortunately even in the study sites which are priority areas for rice production and land reform programs, farmers receive an average of less than three visits by extension workers during the cultivating season.

In most cases, reports Bernstein "the purpose of the visit was to process papers which were required for obtaining an input loan. The education component of extension was largely neglected. At the same time over 75 percent of the farmers wanted the technician to visit more frequently — indicating their receptivity to new knowledge and a positive attitude towards the extension technician."

The relevant issue, therefore, is no longer adoption versus non-adoption, but sufficient knowledge to adopt and use the technology properly. This provides an important, indeed crucial, role for the extension worker. □

Improving Africa's rice crop

Bob Stanley

The lorry driver in Sierra Leone is talking about the cost of living. Take rice for example. The price of a bag of rice has doubled in the past few years, it now costs him about half a month's pay. He shrugs, how can a man feed his family any more? Then he grins, at least, he says, he has security, a government job.

The lorry driver's problem is shared by millions of people throughout West Africa, many of them less fortunate than he. It is a problem that seriously concerns the governments of many countries in the region, and its causes are simple. Rice is a staple food in West Africa, and demand outstrips the locally grown supply by about 600,000 tons a year. In 1974 rice imports to make up that deficit cost West African countries almost \$240 million, pushing up the price in the market place, and putting an additional strain on the region's scarce foreign exchange reserves.

The irony is that the ecological conditions in much of the region are ideally suited to rice production. But the governments of the region are doing something about the rice shortage. They have banded together to form WARDA — the West African Rice Development Association — with one purpose in mind: to make West Africa self-sufficient in rice.

Founded in 1971, the Association today has 14 members: Benin, The Gambia, Ghana, Guinea Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo and Upper Volta. The Association's Executive Secretary, Jacques Diouf, says WARDA is unique — it is organized and managed by Africans for the benefit of Africans. Its policies are set by a

Governing Council composed of one representative from each member country, and each country contributes to the core budget, with additional support, where necessary, coming from donor countries (such as Saudi Arabia and the USA) and from international agencies.

From the start WARDA has taken an integrated approach, concentrating its efforts on three fronts: research, training and development. One of the first things they found out, says Mr. Diouf, was that there were an awful lot of gaps in existing research. So a network of 30 trial points was built up to test varieties from within the region and all over the world under different ecological conditions. First, however, they had to develop their own quarantine procedures at IITA (the International Institute of Tropical Agriculture in Nigeria) in order to meet the Organization of African Unity's regulations governing the importing of new plant varieties. A seed laboratory was also established, and African personnel trained to run it.

Four main rice types were identified in the region — mangrove rice, deep flood or floating rice, rain-fed rice and irrigated rice. This last is the subject of WARDA's newest research effort, and follows on the recommendations of Dr. Robert Chandler, former head of IRRI (the International Rice Research Institute in the Philippines), who was retained by the IDRC to assist WARDA and help establish links with both IRRI and IITA.

Dr. Chandler confirmed what the people who founded WARDA already believed — that the region could produce far more rice. He recommended adapting some of the established rice varieties developed at IRRI,

along with some of their highly successful cropping systems. This is the basic aim of the IDRC-supported irrigated rice project that is now getting underway in Senegal.

At Fanaye near the Richard Toll agricultural research station on a tributary of the Senegal River a 25-hectare site is being prepared for the project. The site is unique in one respect — it contains no less than seven different types of topsoil, ranging from alluvial clay to light sandy soil, that were deposited there over the centuries by the repeated flooding of the river during the rainy seasons.

The river no longer overflows its banks, but it will provide irrigation for the experimental rice crops. Over the next two years the researchers will test and select a number of high-yielding, early maturing rice varieties; develop fertilizer and water management systems for the various soil types; and carry out pest, disease and weed control studies — all on the one site.

Four young African scientists have already received training at IRRI in preparation for working on the project, and four more will soon complete similar courses. Throughout its life the project will also serve to train more African personnel. Training is an important part of WARDA's work, says Mr. Diouf. The Association is establishing a training centre at its headquarters in Monrovia. A specialized training course is held each year dealing with a different theme, and a 6-month course in rice production has been developed in cooperation with IRRI. The Association also makes scholarships available to West African scientists to enable them to receive further training, either in West Africa, or anywhere in the world where specialized courses are available.

In the field of rice development, WARDA has established a regional seed multiplication program, offers advice to national programs in member countries, and has organized a number of regional seminars on rice-related topics. Equally important is the documentation centre, with its computerized indexing system, and a communications unit for translating and disseminating documents. There is even a language laboratory for staff language training — the aim is eventually to have a fully bilingual staff who can operate in either French- or English-speaking West African countries.

What about results? Is that bag of rice soon going to take a smaller bite out of the average West African's pay? It is too early yet, says Mr. Diouf, to attribute definite results to WARDA's work. But he points out that four of the 14 member countries were actually in a position to export rice in 1975. Now the Association is looking at questions of trade between member countries in order to cut down on those costly rice imports from outside. □

The information revolution

Science column by Alexander Dorozynski

Before the advent of writing, human knowledge was transmitted orally, from neighbour to neighbour and from one generation to the next. In the process, the wastage must have been considerable.

The written, and later the printed word, each represented leaps in man's capability of storing and transmitting information, and building upon it. Knowledge could be deposited outside the human mind that had created it, and thus become part of the collective heritage of mankind.

Now, another revolution is taking place rapidly, although it goes almost unnoticed in the sound and fury of everyday life. It is the information revolution, made possible by the rapid development of electronics and computer science.

Consider the solid state integrated circuits that started being incorporated in computers in 1960 or so. One "chip" then contained one component of a circuit. In four or five years this number had quietly risen to 10, and in 10 years, to about 1,000. Now, so-called large-scale integration (LSI) technologies have made it possible to produce digital elements with several tens of thousands of components on a single semiconductor chip less than 1 centimeter square in area. Physical and theoretical limitations have not yet been approached, and it is possible that by the end of the century, a single circuit may contain as many as one million elements.

Computers have become smaller in size, larger in capacity, more flexible, and faster. At the same time, computer functions are among the few things that have become cheaper.

In the industrial world computers have become everyday tools to carry out engineering and scientific calculations, and to play the more prosaic role of keeping financial, production, sales, and other records.

What about the developing world? It is true that the computer is a capital-intensive, labour-saving device, and



Photo: Jack Redden

that as such it does not appear to fit into the pattern of capital-saving and labour-intensive "intermediate technology" generally considered as appropriate to tackle many problems in non-industrialized countries.

But there are several aspects of computer science and technology that set it apart. Computers are the instruments of the new information revolution. They can multiply "brain-power", as the machines of the industrial revolution have multiplied muscle-power. It can be argued that in our increasingly information-based world, the mastery of information sciences is a key that opens the door to all other scientific and technological developments. Thus, while developing countries may find it inappropriate to invest heavily in overly specialized and costly science and technology, computer science may well be in an exceptional, privileged position.

Several arguments can be advanced to support this priority. One is that while the computer is a highly sophisticated electronic device, the principles underlying its capacity for processing

symbols are simple, and the cost of training "software" specialists is small in comparison to the return. Another is that the spectacular progress accomplished in electronics over the past few years is making the computer capital-saving as well as labour-saving. (For example, a single unit of mass storage can store the equivalent of millions of pages of text; its cost is below that of the paper and ink required for the printing of this information; and the cost of retrieving a specific item of computer-stored information is far below that of recovering the appropriate item of printed material).

Another argument is the desirability for developing countries to be able to select and control the information they need. Studies by UNESCO and other organizations show that the bulk of information reaching the South comes from, and is largely controlled by, the North. It is evident that more "horizontal" information flow is required, and this will take place only when the South has its own information scientists and technicians.

There are ways to effect this transfer of computer technology. Recently established or projected information systems are among the most accessible, and least costly means of doing it. One such system is AGRIS, established by the FAO with IDRC support as a kind of "world agricultural information fund". Another is DEVSIS, the projected Development Sciences Information System, which the IDRC has supported in the design stage.

An attractive aspect of such systems is that they help participants achieve several goals simultaneously: that of obtaining specific information required to carry out their own development projects; that of organizing their own internal information systems; and, last but not least, that of training their own information specialists.

It is only then that a country will be a participant, rather than a mere spectator, in the information revolution. □

ACCENTUATE THE POSITIVE

Population planners should broaden the population education curriculum to include studies of women's roles in society, says Brigida L. Jayme, who has recently completed a study of two generations of upper-income Filipino women under the IDRC-sponsored Southeast Asia Population Research Awards Program (SEAPRAP).

Mrs. Jayme's study, *Family role and fertility behavior patterns for two generations of upper class urban Filipino wives and mothers*, destroys some of the myths about women's roles. A questionnaire distributed to married 1970 college graduates and their mothers showed that 84 percent worked after marriage, as did 67 percent of their mothers. Equally significant, many of the younger women claimed to be career women — they worked because they wanted to, not for the extra family income.

How do these factors relate to fertility patterns and family planning practices? The study showed that 88 percent of the younger women and 52 percent of their mothers practice birth control techniques. The career women among the younger generation also prefer smaller, more widely-spaced families, and believe that the quality of the mother-child relationship is more important to good upbringing than the amount of time the mother spends with the child.

Says Mrs. Jayme, who is now with the information division of the Population Centre Foundation in the Philippines: "Population education should stress the pursuit of a career by married women as a self-fulfilling experience, for, as we have seen, a deeper sense of commitment tends to lower fertility, not to mention what commitment to work does for increasing productivity."

'NEW' GRAIN IS AS OLD AS THE INCAS

The Andean region of South America has given the world both potatoes and maize. There are other crops grown here, however, that are virtually unknown outside of the region, and have received little attention from researchers. One of these is quinoa,



Photo: J. Valle-Riestra

a member of the chenopod family, it is believed to be among the most nutritious grains in the plant kingdom.

Quinoa has been grown by Andean hill farmers since before the time of the Incas. In Bolivia an estimated 120,000 small farmers still produce some 12,000 metric tons of the crop each year. Now the government of Bolivia, concerned about the rising cost of grain imports, requires the addition of at least five percent of quinoa flour to wheat flour used in commercial baking. Increased production of quinoa, already in short supply, would not only help to meet this requirement, it would reduce imports and provide better nutrition for the people.

The IDRC is now supporting a three-year research project being carried out by the newly-formed Bolivian Institute of Agricultural Technology to increase production of quinoa, both by developing improved, high-yielding varieties, and by increasing the acreage currently in production.

Quinoa is reputedly superior in protein content to most cereal grains and pulses, and contains other important nutrients, including certain essential vitamins. By selective breeding the researchers aim to produce strains that are also resistant to pests and diseases under farm conditions.

The project will be of considerable significance not only to Bolivia, but also to other Andean countries where quinoa is found, such as Peru and Ecuador, and potentially to developing countries in other parts of the world where similar high altitude conditions are prevalent.

FIBRE REINFORCED CONCRETE

Sisal fibres added to cement in the right proportions can produce concrete beams about as strong as those reinforced with steel, according to researchers at Stockholm's Polytechnical College who are experimenting with the use of natural fibres to reinforce concrete.

Studies are also being carried out to determine the technical properties of other natural fibres, and to assess the risk of rotting or decay in long-term use. The use of natural fibres instead of steel should be considerably less expensive, require a lower level of industrialization and consume much less energy.

FOR OUTSTANDING EFFORTS...

Joseph H. Hulse, Director of the IDRC's Agriculture, Food and Nutrition Sciences Division, is this year's recipient of the International Award of the Institute of Food Technologists. The IFT is an international scientific organization with headquarters in Chicago, having 16,000 members in 99 countries.

The Award, which is provided by the Australian Chapter of the Institute, is presented each year to an IFT member who has made outstanding efforts to promote the international exchange of ideas and understanding in the field of food technology. It consists of an honorarium of \$1,000 and an inscribed silver salver. It is only the second time a Canadian has received the award.

Joseph H. Hulse



Photo: Murray MacGowan

Before joining the IDRC, Hulse was Assistant Director of Nutrition and head of Food and Agricultural Industries at FAO. Earlier he was Director of Research at Maple Leaf Mills Ltd., in Toronto, and prior to that was head of Food and Nutrition Research with Canada's Defence Research Board.

While working in Canadian industry Hulse also served as National Chairman of the Canadian Freedom from Hunger Campaign, the Canada-Mysore Project and the Canadian Hunger Foundation. During 1970 he was Special Advisor to the Secretary General of the United Nations on the world protein problem.

TRAINING FOR YOUNG SCIENTISTS

For many countries in the developing world, it is not so much a shortage of money or lack of innovation that slows agricultural development but a shortage of trained people to promote and adopt the new plant technologies. ICRISAT, the International Crops Research Institute for the Semi-Arid Tropics located in Hyderabad, India has accelerated agricultural development a hundred-fold in little less than three years.

That figure represents the number of young developing-country scientists who have graduated from ICRISAT training sessions and workshops on plant breeding, entomology, microbiology, farming systems and economics. They have now returned to their home countries (among them Bangladesh, Upper Volta, Thailand, Sudan, and Ethiopia), to continue work on increasing and stabilizing food production. The ICRISAT training program is designed primarily to meet the food research needs of the semi-arid regions of the world, a climatic grouping that includes some 48 countries.

Three broad categories of training were evolved in the first three years of the program. For research fellows, an opportunity for young scientists to work with senior researchers at ICRISAT, become acquainted with the most recent developments and work on specific food production problems of the semi-arid regions. For young candidates for advanced degrees, an opportunity to develop competence in one or more of the agricultural sciences necessary to a career in food production. For managers, agricul-

Viewpoint

turalists, administrators, and scientists already working on food production, an opportunity to undertake short non-degree training courses on specialized topics related to their work.

The people attending the ICRISAT training sessions are generally nominated and sponsored by national agencies and organizations in their home countries. ICRISAT itself offers a limited number of partial or complete scholarships.

Obviously no single institution can offer all the training needed to promote agricultural development. However, in training young scientists who in their turn will train others in their home countries, ICRISAT is contributing to the building of truly indigenous research and extension services in developing countries.

PRODIGIOUS PIGS PRESENT PROBLEMS

Chairman Mao once described the pig as being "like a small fertilizer plant" — a view that any pig farmer will readily endorse.

The pig's prodigious output is presenting problems, however, for the people of the Ponggol Basin area of Singapore, where large-scale pig farming is concentrated. The present porcine population of 250,000 will triple to 750,000, the government hopes, bringing self-sufficiency in pork, but a pollution problem for the Basin.

With the support of the IDRC, a pilot project has begun which is experimenting with the treatment of wastes in a series of ponds. The bonus in this scheme is that the algae formed in the ponds will be filtered out and used as a protein-rich feed supplement for the pigs, while the treated water will be re-cycled through the piggery. If the pilot plant now under construction functions as predicted, it will reduce overall costs to well below the level of alternative methods of treatment.

Although Singapore's situation is unique, the development of successful treatment and reclamation techniques here will have major implications for wastewater treatments in the rural areas of the tropics, particularly if the process can also be used for the treatment of human wastes. The potential for a continuous supply of relatively inexpensive feed supplement could also enable farmers to considerably expand their livestock herds.

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada, K1G 3H9.

John Wickham's commentary on *The Artist and Development* (Reports Vol. 5 No. 4) should be read and considered widely by all concerned with development.

On a recent trip to the U.S. Virgin Islands for the purpose of encouraging educational strategies which draw from the indigenous socio-cultural base of the communities there, I was shocked by the virtual absence of cultural self-awareness among Virgin Islanders. There is a richness and depth of human experience underlying the shallow parade of a tourism-dominated society there which cries out for discovery and celebration. The people cannot be whole unless and until that heritage is brought to the forefront of their consciousness. Indeed, the tourists themselves are cheated for absence of opportunity to touch and be touched by a "Virgin Islands" experience (as contrasted to a displaced Miami Beach experience).

The rush for economic development without cultural self-discovery is a sham, for it can only serve to increase dependency in the socio-cultural sense. Mr. Wickham's plea for the will to use Caribbean artists for discovery and interpretation of the Caribbean personality deserves support from the governments involved and outside agencies truly interested in Caribbean development.

Murray E. Durst

IDEAS Inc.

Washington

In his article *Tropical diseases — the enemy within* (Reports Vol. 6 No. 1) Alexander Dorozynski draws an analogy between global expenditures on tropical diseases research and the cost of modern warfare. The analogy is a telling one: \$30 million for research that could save thousands of lives, compared to \$30 million for two jet fighter planes that, even in times of war, would likely kill no more than a few score people before being destroyed or becoming obsolete. Fighter planes, obviously, are not cost-efficient.

But the analogy can be carried farther. The amount spent annually on arms and "defence" dwarfs the total investment in development programs. Problems such as large-scale food shortages need not exist if all the nations of the world would only devote a fraction of the energy and resources they expend on making war to increasing food production and improving food storage and distribution systems.

The "disordered priorities" in health research that have resulted in the neglect of tropical diseases are merely symptomatic of a more general disorder: the sort of collective insanity that can commit billions of dollars to the development of supersonic jet aircraft to cut a few hours off the flight time from Paris to Rio, while 35 delegations meeting in Geneva can find only \$7.5 million between them for tropical diseases research.

Parasites are one kind of enemy within, but in the final analysis perhaps mankind is his own worst enemy.

S. J. Njeru

Nairobi

Kenya

In Reports Vol. 6 No. 1 you show on page 10 a device which is identified as a "hand operated sorghum thresher". In fact this is not a threshing machine, but a cleaning machine. In German, the device is called a "Windfege", in Swiss dialect, a "Röndle". Unfortunately I don't know the English name for it. The purpose of the machine is to take the uncleaned grain and chaff mixture which comes from the threshing machine and to (a) by the action of forced air to blow the (lighter) straw or chaff from the (heavier) grain; and (b) to sort the grain by size.

How do I know? During World War II as a young refugee in Switzerland I spent many hours pulling the crank on a machine just like it!

Walter H. Oettinger, P.Eng.

Vienna

Austria

Health workers bridge the gap

Marciana Jurado is a young woman who lives in a village in Panama. To the villagers she is no ordinary young woman, she is their medical assistant, their link with the country's health system. This is because she is a local girl, elected by the villagers themselves to receive training at the district health centre that enables her to provide the basic health care the villagers urgently need.

Marciana is one of 40 medical assistants who have been trained by the government of Panama as part of an experimental rural health care delivery program. She may not know it, but she has a lot in common with Mr. Mechai, a farmer in Thailand, with Eugenie Lavallée, a Cree Indian in Canada, and with others doing similar work in rural communities in Bangladesh, Iran and Venezuela.

All these people are the principal players in a new film, *Rural Health Workers*, about six programs in very different parts of the world that are attempting to bridge the gap between sophisticated city hospitals and the small rural communities, where health services are often non-existent. But they are not actors, they are real people doing real jobs. Neill McKee, head of IDRC's Audio-Visual Unit, filmed each of them at work: travelling to remote jungle villages, to the Canadian prairies in midwinter, to tiny settlements in the rugged desert country of Iran.

The film compares the approaches being taken in six countries, and includes interviews with both the health workers and the program planners. In examining these six examples the film demonstrates that there is no one way to meet the health needs of rural peoples — different situations require different solutions. But it also shows that when the problems are met head-on with imagination and the involvement of the rural people themselves, then they can be solved.

Rural Health Workers, 16mm. colour 28 mins., is available for loan or purchase from IDRC Audio-Visual Unit, Box 8500, Ottawa K1G 3H9.



There is a burst of activity in Asia these days, aimed at achieving a greater public understanding of science. Some — perhaps even most — Asian nations are just waking up to the need for more public appreciation of how science and technology can help national development.

Leaders in these countries argue that popularizing science encourages people to understand and co-operate with government actions on large-scale problems such as conservation, pollution, irrigation, sanitation and infectious disease. They argue that interesting the youth of a country in science increases the country's science manpower and speeds national development.

Communicators have been quick to respond to this line of thought: A month-long Asian training course for leaders in the Promotion of Public Understanding of Science, Technology and Environment (PUSTE), sponsored by Unesco and the Science Foundation of the Philippines, was held in Manila from February to March.

A seminar, "Scientists as Communicators", held in Colombo last February, attempted to sharpen the communications skills of scientists and journalists from Sri Lanka, Bangladesh, India, Malaysia, and Thailand. The seminar was organized by Sri Lanka's World University Service and supported by the IDRC.

The Press Foundation of Asia, the non-profit parent organization of DEPTHnews Science Service, is considering two meetings of Asian science writers this year. The PUSTE meeting here also considered a committee's suggestion for such a gathering.

At the University of the Philippines (UP), weekly seminars attempt to link media writers with researchers whose work is sponsored jointly by the UP and the National Science Development Board (NSDB). Under co-ordinator Dr. Joventino Soriano, this NSDB-UP media linkage program has already held a four-day science writers' seminar in a mountaintop "think-tank", and a travelling seminar which rolled through villages in three provinces north of Manila in seven buses last April. Each bus carried media writers with researchers from seven separate areas of science or technology.

Participants at the seminar in Colombo felt that what is needed to bring science and technology news to the people is a regional organization that could pool and disseminate scientific knowledge throughout Asia.

Prof. P. P. G. L. Siriwardene, vice-chancellor of the University of Sri Lanka, noted that science has to be written in the vernacular to get to the people. The dissemination of scientific knowledge, he said, must be carried out "not in a haphazard manner, but as an important national venture."

Dr. Wimal Dissanayake, head of the

Bringing science to the people

Mack Laing

university's mass communications department, said the science-communicator cannot afford to patronize or "talk down" to his audience. Scientists, communicators, and audiences are equal partners in a common voyage of discovery. "Isn't this what science is all about?" he asked.

Ernest Corea, of the IDRC's Publications Division, said the mounting Asian commitment to improving the well-being of its peoples must involve the application of science and technology to the various human endeavors that, in their total, add up to human life.

He added, "If this holds true for the entire region, it follows that communication processes, as related to development, should be regionally conceived and applied."

In another development, Sri Lanka's Ministry of Education is planning to provide scholarships for science writers to obtain university science degrees. Selections will be made by a committee representing the National Science Council, the Book Development Council, Unesco National Council and Sri Lanka's Association for the Propagation of Science.

"The course is designed to develop the ability of writers to convey scientific knowledge to the layman in its most acceptable form," said Education Ministry Secretary Dr. P. Udagama. "In the first instance we will pick personnel already engaged in the profession as science teachers, as they are those who are most familiar with the needs of the student."

The Philippines, meanwhile, is now moving at full steam to spread information on science and technology to the people. In a speech read by NSDB Chairman Melecio S. Magno at the opening of the course to promote public understanding of science in Manila, President Ferdinand E. Marcos told the delegates: "We are belatedly finding out that the harnessing of

science and technology is not a mere matter of learning formulas, but a process of cultural transformation itself, a process of building toward a new and modern culture. It is in this light that I perceive the importance of promoting wide public understanding of science, technology and the environment."

Unesco's Dr. George Dontsov said there was a danger that developing countries would be left even further behind the developed world unless developing countries could get their peoples to understand science better.

Dr. Thomas G. Flores, of the Philippine Council for Agriculture and Resources Research (PCARR), described a basic communications problem: "Many times the professional writer tends to 'sensationalize' the information to get it into the media.

"So on one hand, you have the scientist who insists on scientific language; on the other, you have the popular writer who wants to simplify the information to the extent it no longer looks like the original. It is no wonder there is no love lost between the scientist and the media practitioners."

Mrs. Gloria Gatchalian, of the Science Foundation of the Philippines, noted that only 30 percent of 1972 college graduates here came from the natural, medical and engineering sciences. She said formal education was not meeting the country's need for scientists and technologists. "The answer is the enrichment and intensification of non-formal science education."

Mrs. Gatchalian said this out-of-school approach was being strengthened in the Philippines by the formation of Science Clubs, which undertake science projects. Last year (1976), she said, there were 741 clubs with 50,150 members. There is a confederation of these clubs and, since 1971, it has brought together six national Youth Science Camps, said Dr. Tomas C. Ongoco, assistant director of the Science Foundation of the Philippines. He said science campers who have gone to rural areas on projects to explain science to farmers and remote villagers have helped to conquer ignorance and superstition.

The formation of the Philippine Science High Schools, the Science Talent Search, the organization of Science Fairs and the creation of science attachés in the Philippines' foreign embassies are other moves that have promoted the public understanding of science.

This report was prepared and distributed by the Science Service of DEPTHnews, a specialized news service on science in development supported jointly by the Press Foundation of Asia and the IDRC. For more information on DEPTHnews Science Service, write P.O. Box 1843, Manila, Philippines.

The news media — partners or adversaries?

Albert S. Talalla

The following article is extracted from a paper presented by the Malaysian High Commissioner to Canada, Mr. Albert S. Talalla, at a seminar on communications in development organized by the Ottawa chapter of the Society for International Development. His main theme was Government and the media: adversaries or partners?

With independence in 1957, Peninsular Malaysia faced the problem of consolidating a nation with a multi-racial society characterized by socio-economic and cultural differences. Further the communist insurgency continued, being only contained some three years later. Then in 1963, the formation of Malaysia heralded a period of further national integration fraught with many external threats and challenges. This was followed six years later in 1969 by an outburst of racial conflict which pointed up areas of weakness that undermined the very foundations of the nation.

The trauma of racial conflict caused a critical self-analysis of what went wrong. The principal outcome was the adoption of a New Economic Policy designed to achieve national unity through its two-pronged objectives of eradicating poverty irrespective of race, and restructuring Malaysian society to eliminate the identification of race with economic function.

The twin objectives of the New Economic Policy are pursued through a series of 5 year Development Plans and the Third Malaysia Plan was launched last year to cover the period 1976 to 1981. It envisages an annual growth rate of 8.5 percent in real terms, the creation of some three-quarter million new jobs and a reduction of unemployment. The target for public development expenditure is 90 percent higher than the amount spent under the last Plan. Private investors both domestic and foreign will have a crucial role to play in the realization of the Plan's objectives.

All this has to be pursued against the backdrop of the stepping-up of the internal communist offensive, both military and otherwise, with increased subversion and terrorist activity threatening national security. The countering of this threat demands very high priority and inevitably precious resources have to be channelled off for this, resources which otherwise could be devoted to socio-economic development.

I hope in this summary of Malaysia's background and our development plans I have been able to give you some idea of the dimensions of our problems, the difficulties within which we have to operate and to place in perspective the enormous role that the media have to play in development.

In the developing world the tasks of journalism are more

onerous than in the West, as the mass media are vital tools in the socio-economic development process. The media transmit new ideas and concepts to an emerging literate population and serve an instructional purpose, in contrast to the largely public affairs and entertainment roles of the media in an affluent society. Indeed, in a developing country the newspaper is sometimes the sole medium of culture, opening up new vistas of progress and broadening the horizon of the mind.

In Malaysia, the electronic media are nationally directed and very heavily involved in the task of developmental communication. Radio Malaysia and Television Malaysia gear their programs towards giving full and in-depth information on all Government policies and projects, and stimulating public interest to achieve change in line with Government policy.

There are 46 newspapers published in Malaysia all privately-owned. Seven are published in the national language with two using the Arabic script, 13 in English, 21 in Chinese, three in Tamil and two in Punjabi. Newspapers such as the *Utusan Melayu* have been important vehicles in arousing political consciousness as well as in aiding the struggle for independence. The paper is now equally active in promoting the aims of development in the post-colonial era.

The running themes throughout all Malaysian media are development, security and national unity in a multi-racial society. The media in Malaysia are a vital means of transmitting knowledge and knowhow and in obtaining feedback; and in the task of welding national unity out of three disparate identities they play a crucial role. The partnership between the media and the public leadership in the quest for social justice has been a long-standing one.

Let me now turn to the foreign media. In the ambience of libertarian democracy, freedom of information and the public's right to know are dominating compulsions in journalism. The press as the Fourth Estate sees itself as ombudsman and protector of the public interest. While it may play this role domestically, I am sorry to say that its treatment of foreign news, particularly news of the Third World, leaves much to be desired.

For a start, coverage of the Third World is sadly limited. A great newspaper like the *New York Times*, devotes five percent of each issue to foreign news, and I leave you to imagine where the Third World stands in terms of priority. The situation with the Canadian newspapers is unhappily generally worse. Then again most of the news that is circulated around the world today is dominated by Western sources. For an alternative source, Western media send out

newsmen, all too often of unimpressive calibre, who conceive their primary function as being to report the unusual, the sensational and the controversial even on the basis of fleeting visits and incomplete facts. The newsflow from the Third World through Western news agencies is regrettably often of the same type. Finally, the news, when it does reach the printed page, is essentially the news of contention and of what went wrong in the country reported on.

For Malaysia, this situation is disappointing. The Third Malaysia Plan relies heavily on private sector financing and the Government has gone to great lengths to create and maintain conditions attractive to the private sector investor. The media, if it is to assist in development, should at least be prepared to provide some objective coverage of our efforts. Sadly this is generally not forthcoming. The fact that Malaysia, somewhat uniquely, has contained and continues to contain a communist insurgency is hardly ever mentioned. On the contrary, when reports appear of the killing or maiming of our policemen or security forces by terrorists, almost invariably the reports portray us as a tottering domino. When Malaysia suffered racial trouble in 1969, coverage was wide and vivid and regrettably inaccurate in many instances. However, when we took the somewhat uncommon step of returning to Parliamentary rule, this received scant coverage. These are hardly the acts of partners in development.

I would be the first to admit that we are far from being beyond criticism. Indeed we accept legitimate criticism even when our detractors fail to appreciate the sometimes uniquely difficult circumstances in which we seek to correct the ills in our society. But patently inaccurate reports, sometimes scurrilous even malicious, can do irreparable harm and even bring a nation to its knees. An individual at least can have recourse to the law for redress if he is slandered by the media, but even this recourse is denied to a nation similarly slandered.

I feel in all fairness that I must exclude from my general comments those fine journalists and media who have given us fair coverage. I do not for one moment mean only those who have written glowing reports about us, but rather those who have taken the trouble to study our problems, to talk to people and present a balanced picture of the situation. What is distressing is the "instant expert" who, after sitting in a hotel bar for a couple of nights, thinks he has all the answers when the best brains in a country after long and agonizing labour proceed with great circumspection.

But I am not without hope. When as distinguished a journalist as James Reston of the *New York Times* can express regret that there are no really effective African or Asian news agencies to provide the news, he recognizes the deficiency of the present news gathering systems. Mr. Reston has incidentally also recognized the problem of lack of printed space for the Third World and the widespread journalistic failing of reporting contention when reporting at all. The Non-Aligned news pooling arrangement which was endorsed by the Colombo Summit has happily found general support, and with Unesco sponsorship, the news pool should be operational soon. This is indeed a very significant development and I applaud the developed world for going along with the proposal and enabling Unesco to get behind the new arrangements with the vast resources at its disposal. But only the first deficiency has been met. An enormous task lies ahead with the media of the developed world to persuade them not only to print but also to break the journalistic hang-up of reporting only contention.

It is crucial to Malaysia that the ambitious targets we have set for our development should be reached, and the role of the media is enormous if our plans are to succeed. This challenge has been taken up by the domestic media who by their performance, are in a very real sense partners with government in development. Regrettably the foreign media for the most part make a minimal contribution to development and I am tempted to conclude by asking if some of the foreign media could not indeed be adversaries of development! □

New publications



Canada's Role in World Agricultural Development, by W. David Hopper. Published May 1977, 16 pages, IDRC-085e.

This booklet presents the full text of the J. S. McLean Memorial Lecture given by the IDRC President at the University of Guelph. An extract from Dr. Hopper's lecture appears on page 9 of this issue of *IDRC Reports*.

Agriculture, Food and Nutrition Sciences Division: the First Five Years. Published May 1977, 48 pages, IDRC-089e.

The AFNS Division absorbs the largest portion of the IDRC's research funds. This well illustrated booklet outlines the division's structure and program philosophy, and reviews its activities in the fields of crop sciences, animal sciences, fisheries, forestry and post-harvest systems.

Evaluation of the CARIS Pilot Project. Published May 1977, 32 pages, IDRC-TS5e.

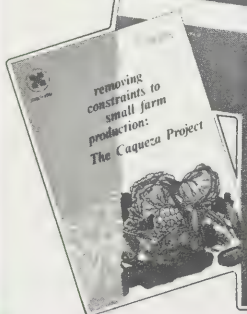
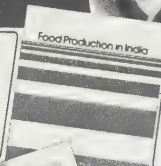
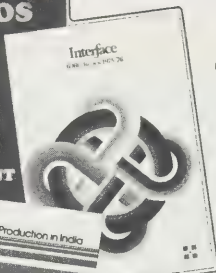
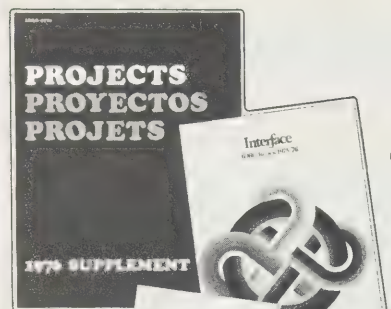
The Current Agricultural Research Information System pilot project was begun in 1972 to test the feasibility of establishing such an information system on a global basis. This booklet in the Technical Studies series gives the background to the project, and an evaluation of its achievements.

For details of how to obtain copies of these or other IDRC publications, see advertisement on the back cover of this issue.

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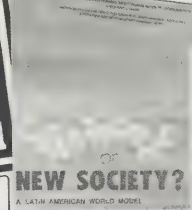
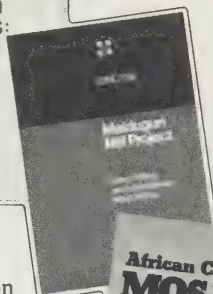
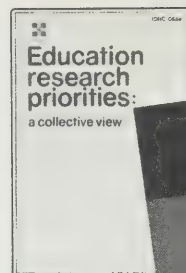
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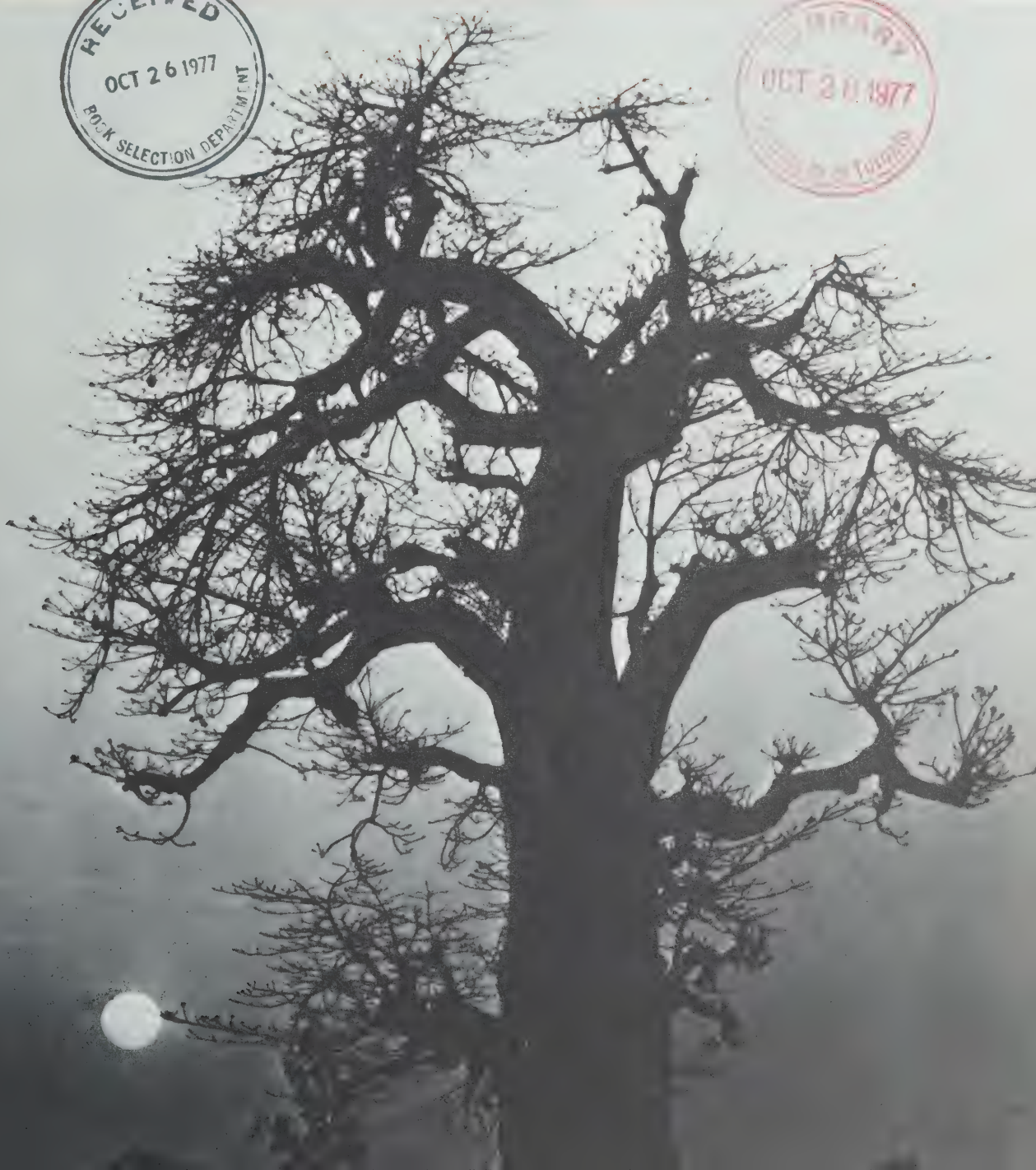
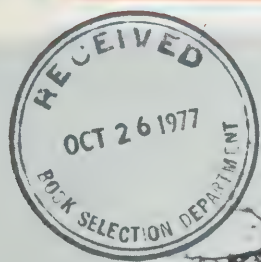
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Cover photo by Neill McKee: the mighty Baobab symbolizes the importance of trees to the African people and their environment. See article on facing page.

- 3 **The African tree — man's best friend**
Trees are essential to both man and his environment in Africa, says Gunnar Poulsen.
- 6 **Elephant grass is good for cows . . .**
In Egypt Alexander Dorozynski reports on several projects to provide much-needed cattle feed.
- 8 **. . . and they like weeds too**
And in the Caribbean David Spurgeon finds cattle feeding on a healthy crop of weeds.
- 9 **The real cost of the arms race**
New strategies are needed to meet the challenge of arms control, say world leaders. Report by Michelle Hibler.
- 11 **Dossier: Water and sanitation**
"Water for all" is the rallying cry. But is it really that simple? In this dossier five articles examine various aspects of the water supply situation in developing countries, challenge some of the conventional wisdom on the subject, and present some workable alternatives.
- 18 **Nigeria: blending the old with the new**
The traditional chiefs are an important part of Nigeria's new local government plan, reports Jean-Marc Fleury.
- 21 **Commentary**
Good libraries and trained librarians are vital to development, says Jean de Chantal.
- 23 **Science in development**
There's gold in that garbage, column by Alexander Dorozynski.
- 24 **Viewpoint**
Readers' views on *IDRC Reports* articles.
- 25 **Briefs**
People, projects, events.
- 26 **The scientist as poet**
Alexander Dorozynski talks with soil scientist Daniel Hillel on the poetic qualities of the computer.
- 27 **New publications**

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The African tree— man's best friend

Gunnar Poulsen

Gunnar Poulsen is a citizen of Denmark. He studied forestry at the Royal College of Agriculture and Veterinary Science in Copenhagen and at Ecole Nationale des Eaux et Forêts, Nancy, France. Since 1956 he has worked in Africa, where he spent 10 years in the dry regions of Western Sudan and eight years on the mountains of Ethiopia. Before joining the IDRC as a Senior Research Advisor he was teaching forest biology and forest protection at the University of Dar es Salaam, Tanzania.

This article is based on the first of three papers on African forestry written by Gunnar Poulsen, soon to be published in collected form in the IDRC monograph series.

Over large areas of the African continent, the trees that grow outside the plant communities we call forests are about as important as the trees that grow inside them. This article is an attempt to describe the ways in which trees may be useful to man — useful in the broadest sense of the word.

First, a definition of what we mean by a 'tree' and a 'forest' may be useful. By tree, we mean any self-supporting woody plant that, when fully grown, exceeds a height of a couple of metres; really, anything from a straggling desert shrub to the 70-metre king of the rain forest. A forest is any area on which trees, in closed stands or more or less evenly scattered, constitute a conspicuous part of the growing plant community (but not including orchards).

Trees are useful to man in two distinct ways: as producers of a wide variety of goods, commonly called 'forest produce', and as custodians of favourable environmental conditions. It would not make sense to try to qualify one of these functions as more important than the other. Both are indisputably essential to

the well-being — indeed to the survival of man. We shall look at these two types of 'tree-roles' separately, beginning with the production aspect.

Trees in Africa as elsewhere are naturally first of all producers of wood. There are many kinds of wood, however, and their uses are almost innumerable. Wood, in one form or another, enters into practically every sphere of human activity. It is characteristic of almost all African countries, however, that by far the most important utilization of wood is in the form of fuel, principally firewood and charcoal.

Tropical Africa covers approximately twenty million square kilometres. Of this huge area, probably about half can be described as forest-covered: from the open scrub vegetation at the edge of the desert to the impenetrable rain forest of the Congo basin. Really dense forests account for less than two percent of the forest area, however, the rest consists of various types of 'bush'. The area covered by artificial, and often highly productive, plantations is an infinitesimally small fraction of the total forest area.



Photo: Marshall Laird

In terms of wood, the productivity of the natural African forest is not high. Annual yields vary from a fraction of a cubic metre per hectare to about five cubic metres per hectare. A considerable output is also obtained from scattered trees on farmland.

Of the total increment of the African tree vegetation, probably less than one fifth, or an estimated 300 million cubic metres, are at present being utilized. Despite this seemingly favourable relationship between production and consumption, the wood supply situation is far from rosy. The forest resources are in fact dwindling at a frightening pace as a result of the combined onslaught of firewood and timber exploitation, the clearing of land for farming, and last but

not least, annual bush fires. Over large areas of Africa, a severe shortage of firewood and timber is already making life difficult for millions of people.

There are, however, many products other than wood produced by African trees. Both the leaves and the fruit of the Baobab are used for human consumption in West Africa. From the bark of the same tree a cord is made that is utilized for stringing beds in the Sudan. From the bark of *Acacia nilotica*, on the other hand, the Masai of East Africa make a stimulating tea-like beverage. In some parts of Somalia the nut of a desert shrub *Cordeauxia edulis* is an important source of protein. Elsewhere in Africa, the young seedlings of the *Borassus* palm are cooked and eaten. A refreshing drink is made from the pods of a large savanna tree, *Tamarindus indica*. In Mali this drink is even produced industrially in tins. The fluff, or kapok, of trees of the *Bombax* family is used for upholstery. An infusion of the female flowers of *Hagenia abyssinica* is used as a vermifuge, just to mention one of many medicinal uses of trees. In a few areas arrow poison is still in use on a small scale; a common component is the latex of the Desert Rose, *Adenium honghel*. Industrially important extractives are obtained from the wood, bark, leaves and fruits of many species, for example tanning extractive from Wattle, and Shea-butter from the Shea-butter nut tree of the West African savannas. Some trees produce valuable exudates, the most important being the Gum Arabic that is tapped from various acacias in the Sahel Zone.

Of extreme importance, especially in the drier parts of the continent, is the production of cattle feed. Over large parts of Africa livestock obtain a considerable proportion of their nourishment from the trees in the form of fruits and leaves. Probably more than one hundred species are useful in this respect, the most notable being *Acacia albida*. In some areas, the South American tree, *Leucaena glauca*, is being planted for

commercial production of cattle and poultry feed.

In some regions of Africa, however, there is a conflict between trees and cattle ranching. Tsetse flies thrive only within woodland, and are often controlled by deforestation. The systematic cropping of wildlife to produce meat in tsetse-infested areas is an alternative favoured by some scientists, but serious doubt must still be expressed about its practicability. On the subject of wildlife, it should be stressed that a well-wooded environment is also a necessity for the survival of many of the species that comprise the extremely rich fauna of this continent.

The last non-wood forest product to be mentioned is honey. Many African trees, especially of the leguminose order, are excellent nectar producers, and offer an enormous potential for honey production. So far, however, this potential has been only marginally realized.

Beside being producers of a variety of useful goods, African trees play an extremely important role in maintaining a favourable environment. They exercise a useful, often indispensable, role in the cycling of plant nutrients, soil and water conservation, the maintenance of favourable macro and micro-climatic conditions, and last but not least, the creation of shelter, shade and beauty around dwellings.

The importance of trees for the cycling of plant nutrients is often overlooked, to the detriment of the soil fertility on which farming, animal husbandry and plantation forestry depend.

In the tropics, particularly the humid tropics, a considerable proportion (frequently more than 75 percent) of the soluble plant nutrients that are present in a certain area, is held within the biomass of the growing plant community. In this respect conditions are very different from those prevailing in temperate countries, where most nutrients normally are present within the upper layers of the mineral soil. In Africa, nutrients released from decaying organic matter do not seep down into the soil as in temperate countries. They are to a very large extent intercepted by a dense web of roots that the trees maintain just under the surface, a web made almost impenetrable by the additional presence of mycorrhizal fungi (the subterranean parts of some mushrooms that live in symbiosis with the roots of certain trees). As a result, the nutrients 'cycle' almost continuously



A severe shortage of firewood often means carrying heavy loads over long distances.



Making cord from the bark of the Baobab — the leaves and the fruit are edible too.

Trees, crops and animals in the right combinations can be mutually beneficial.



Photo: Jean Speckle

within the biomass, only a small proportion entering the mineral soil. In this way the vegetation has adapted extremely well, in the course of a long evolution, to the environment. Under hot, humid conditions any soluble nutrient element in the soil is, in fact, exposed to loss by leaching.

In cases where most of the biomass, including the subterranean part, is destroyed by cutting down the forest, usually to provide land for farming, this protective system breaks down. Soluble plant nutrients are released into the mineral soil, with no 'safety net' of roots and mycorrhiza to intercept them and prevent their being leached. A high humus content and a granular soil structure may slow down leaching for a few years but, as the humus decomposes and the soil loses its original favourable structure, the leaching process will accelerate.

The initial release of a large amount of nutrients into the soil will naturally result in great, if transitory, fertility. The farmer will reap excellent harvests during the first years after forest clearing. However, as leaching increases, yields will decline and eventually the farmer will be forced to abandon a completely exhausted soil — either to a long period of bush-fallow or, in the most severe cases, permanently. Some farmers may be able to halt the deterioration of the soil by the application of fertilizer, preferably combined with some kind of mulching, but many lack the resources to do so.

In some areas of Africa farmers have adapted extremely well to the imperatives imposed by the pattern of nutrient cycling. By mixing perennial crops, such as coffee, bananas and sometimes even large trees, with short-cycled crops such as maize, cassava and beans, they ensure that the amount of growing biomass never descends below a critical level. Alternatively, soil fertility may be maintained by the frequent application of mulch. This may be achieved by maintaining a certain proportion of each farm, preferably steep slopes and other erosion-prone areas, under tree cover. Branches lopped off the trees can be used to mulch the nearby fields.

The *Acacia albida* tree deserves special mention in the context of nutrient cycling. This large savanna tree occurs mainly on sandy soils in some of the drier parts of Africa. In general, the land where it grows is farmed and valued for

its high fertility. *Acacia albida* has in fact a remarkable farm-improving influence. Contrary to all normal 'tree-behaviour', it drops all its leaves just at the onset of the rainy season. In the hot humid weather then prevailing, the leaves decay rapidly releasing nutrients into the soil just when the agricultural crops need them most. In the dry season, on the other hand, the tree is covered by a dense foliage and its cool shade is then much favoured by cattle. Towards the end of the dry season, cattle are even more strongly attracted by the huge amounts of protein-rich pods that drop to the ground under the trees. This continuous presence of cattle near the trees assists enormously in the upkeep of soil fertility. Finally the large crowns of the *Acacia albida* provide an excellent protection against wind-erosion.

The role of trees in soil and water conservation is no less important, especially in hilly and mountainous country. Better than any other ground cover, forest will ensure that the soil layer indispensable for water-catchment is maintained and not carried away by erosion. At the same time, the soils under the forest develop an open granular structure, that permits rain water to infiltrate quickly, to percolate to deeper soil layers from where it gradually may be released in springs and water courses.

Conversely it is known that large scale deforestation of steep slopes may lead to complete environmental degradation. The soil is carried away from the slopes leaving these bare and useless to man. In the valleys below, a formerly regular water supply becomes spasmodic and unreliable. During heavy rain-storms flood waters thunder down from the hills burying valley soils under gravel and stones, destroying crops and silting dam sites.

All slopes cannot normally be maintained under forest of course, but the steepest slopes and important catchment areas should never be deforested. On

less vulnerable sites good farming practices, combined with the upkeep of some tree rows along contour lines, may provide sufficient protection against environmental deterioration.

Erosion is not caused by water alone but also by wind, particularly in the drier regions. Wind erosion may carry away the most fertile soil particles from farmland. In other places, crops may be damaged or even killed by wind-blown sand particles, or just buried under a layer of sand.

In all cases the best remedy against wind erosion is the maintenance or planting of trees, either in the form of shelterbelts or more or less evenly distributed tree vegetation. Where there are many trees, there will be no wind erosion.

A dense tree vegetation, or a system of artificially established shelterbelts, exercises a beneficial effect on micro-climatic conditions in several other ways. The rapid expansion of desert conditions that has been observed these past years along the southern fringe of the Sahelian zone, has been caused partly by a succession of years with exceptionally low rainfall and partly by man's own destruction of the environment. The combined effect of overgrazing, overexploitation of the already scanty tree vegetation, and in some regions the introduction of mechanical farming in low rainfall areas, have resulted in the denudation of large tracts of land. Within these areas, the micro-climatic conditions, coupled with the wind erosion problem, have made conditions for animal husbandry and crop farming unfavourable even in years of above average rainfall. But what may be even more serious, from these man-made desert areas hot scorching winds blow into the farmland further south, reducing yields and destroying crops.

The desertification process is frequently compounded by people, deprived of forest resources, being forced to

burn animal manure and crop-residues, thus depriving the soil of these sources of humus and plant-nutrients. This not only results in poorer crop-yields, as would be expected, but also reduces the plants' ability to withstand drought conditions, an ability which is closely related to the availability of nutrients in the soil. So in a marginal climate a drop in soil fertility will often lead to complete crop failure.

While there is no doubt that vegetation ground cover, especially trees, favourably influence the micro-climate, little exact information is available about possible effects on the macro-climate. Do such phenomena as higher day and lower night temperatures on denuded land, and an increase in the amount of dust in the higher atmosphere over overgrazed and overcultivated land, result in reduced rainfall? We really do not know in a scientific way. We only suspect that it is so. Not knowing for sure, we give the trees the benefit of the doubt and advocate the afforestation of dry areas. It may lead to better rainfall, or it may not. It will at least improve the micro-climate, and that in itself would be very valuable.

We have considered the importance of trees for the physical environment, the environment on which our supply of food and many other material goods depend. However, man does not live by bread alone. Human fulfilment also depends on a less tangible quality in our environment which we call beauty. Trees with attractive foliage and fragrant flowers around dwellings enrich the lives of those living in them and at the same time protect them against sun, wind and dust. Green belts around towns serve a similar purpose and provide leisure areas where people can escape the hustle and bustle, and fumes and stress, of modern urban life.

Trees may thus provide not only some of man's most basic physical requirements, but for some of his mental needs as well. The role of the tree in Africa is to contribute to the maintenance of an environment that is friendly to both man and beast. □

Elephant grass is good for cows . . .

Alexander Dorozynski

Although Egypt has some of the most productive agricultural land in the world, the country is suffering from an acute shortage of meat and animal products. The reason is a corresponding shortage of cattle feed, particularly during the dry summer months. This has resulted in the diet of the average Egyptian being among the lowest in the world in terms of animal protein.

A major effort is now underway, however, to remedy the situation, and three research projects appear to be particularly promising. Two of these projects are geared to the utilization of by-products that are at present either under-utilized or completely wasted.

The country's four main crops — cotton, corn, rice and sugar — yield more than 8 million tons of by-products: some 2.5 million tons of corn stover, 2.1 million tons of cotton stalks, 1.5 million tons of rice straw, as well as cotton seed hulls, corn cobs, rice hulls, sugar cane bagasse and molasses.

At present none of these is used in the production of pelleted feed, which relies principally on the limited availability of one major ingredient, cottonseed cake. Yet, these by-products are potential sources of feed — provided they are processed, and introduced, in the right proportion, in feed formulas.

This is the goal of a research project now underway at the Faculty of Agriculture of the University of Alexandria. The project is being carried out by the Department of Animal Production, with the support of IDRC.

In a series of laboratory experiments the researchers have developed physical, chemical and microbiological processes to improve the digestibility and nutritive value of the by-products. Feeding trials have indicated that the processed by-products can be used as components of pelleted food in proportions of about one-third, perhaps even more.

Dr Khaled El-Shazly, project leader and head of the Department's animal nutrition unit, and Dr A.R. Abou Akkada, principal investigator, are both members of the eight-man Animal Production Commission, responsible for government policy on livestock. They work in collaboration with the High Commission on Animal Feed, with the aim of devising feed formulas for specific requirements such as milk production, beef, sheep, and poultry, that can be adapted to make best use of local availability of by-products.

The nutritive value of several feed formulas has been tested in the laboratory. Feeding trials have given good results and work is now underway to establish a semi-industrial pilot plant capable of producing about one ton of pelleted food per hour. This plant is expected to be operating by the end of the year. The ultimate goal is the establishment of a number of small-scale local plants, down to the scale of cooperative farms, some of which are participating in the project.

Experiments are continuing at a small research station near Alexandria to improve the quality of by-products. Processing methods include chopping, milling and steam treatment, chemical delignification, and microbiological treatment. The latter involves ensilage, use of lignin-dissolving bacteria, and



Dr Makky (centre), director of the Animal Production Research Institute in Cairo, views cattle feeding on elephant grass with one of the farmers participating in the project.

of fermentors. One research group has already developed a simple and effective treatment using ammonia and acetic acid, that could be applied by ordinary farmers. These experiments are also followed by feeding trials.

Dr El-Shazly, and Dr Akkada believe that this project could lead to the production of 2.5 million tons of pelleted food per year, the estimated "maintenance ration" for the country's livestock. Actual production of pelleted food at present is about 800,000 tons per year. Small production plants, says Dr Akkada, could be set up at relatively little cost, and larger farms could have their own.

This research has attracted the interest of the Arab Organization for Agricultural Development and of several African countries that could take advantage of similar utilization of agricultural by-products (for instance, huge amounts of groundnut hulls in Sudan, whose researchers have visited the Alexandria project). Plans are underway to offer courses to students from other Arab countries beginning next year.

At the same time, researchers in Alexandria, with the support of the U.S. Department of Agriculture, are exploring another way of increasing feed production, through the utilization of by-products of the food canning industry, which is chiefly concentrated near Cairo and Alexandria. Collecting garbage from a number of Alexandria's restaurants was a part of this approach. Indeed it was found that garbage, once sorted and ground-up, constituted a complete poultry ration, with a high protein content of 22 percent. This is not surprising, notes Dr Akkada, since poultry started as a "backyard industry", with chickens being fed mainly with the farmer's waste.

Another research project also aimed at increasing animal production is being undertaken by Dr A.M. Makky, director of the Animal Production Research Institute at the Ministry of Agriculture in Cairo, also with the support of an IDRC grant. His idea is to introduce elephant grass, native to Uganda, as an additional source of summer forage, which is now in very short supply.

At present, points out Dr Makky about 80 percent of the agricultural land in Egypt is devoted to five crops: cotton, wheat, clover, corn and rice. The rest is used to grow sugar, onions, vegetables, fruits and other secondary crops. In spite of the high productivity of the land there is a shortage of animal production and one of the major reasons for this shortage is lack of summer forage. In the winter period, says Dr Makky, clover covers 95 percent of the animals' requirements, but no forage is grown in summer, so that cattle are kept on wheat straw, strippings of corn leaves, wheat and rice bran, and cottonseed cake concentrate. There is, points out Dr Makky, a shortage of more than 3 million tons of starch equivalent, equal to about 6 million tons of cottonseed cake or 4 million tons of corn grain.

The research project, undertaken with nutritionist M.K. Hathout, shows that additional summer forage could be grown by introducing new forage crops in such a way as not to disturb

the farm economy. Elephant grass (*Pennisetum purpureum*), also known as Uganda grass, is a good candidate, and it is being introduced experimentally in a kind of musical chairs game in which crops are moved around in such a fashion that the net productivity balance of the land is increased.

Say that in a farm where rice, corn, wheat, cotton, clover and secondary crops are grown, one hectare is used to grow clover in the winter, and corn (or corn and rice) in the summer. Dr Makky and his team calculated that a net gain could be obtained if half of that hectare was permanently devoted to elephant grass, productive in the summer but dormant in the winter. The other half will be used, in summer, to grow corn, and in winter, to grow additional wheat to compensate for the loss of grain from the half now occupied by elephant grass. That area devoted to elephant grass will nevertheless continue to produce clover in the winter.

Research has shown that elephant grass can be cut up to 10 times during its growing season. It should be cut after it reaches the height of one metre (not more, as it then becomes lignified, too tough and indigestible). A hectare of land can thus yield up to 120 tons of elephant grass, as well as clover in the winter. The system results in increased total production (and increased total income). According to Dr Makky, additional animal feed estimated at more than 5 million tons of starch equivalent could be produced in Egypt. An economic study indicates that this new crop system could lead to a total gain in cash value exceeding 150 million Egyptian pounds, and even more once this forage is converted to milk and meat.

Elephant grass growing in odd plots around the Ministry of Agriculture building in Cairo is an unexpected sight in this crowded city. It was planted there when the study of different germ plasms and of other summer forage, was started. Now several hectares of elephant grass have been planted in an experimental station 80 km. north of Cairo, where nutrition, metabolism, and milk production trials are underway. The new crop system must then be tried out on farms to make sure that the "musical chairs" game can be kept going year after year, and that the elephant grass is gathered at the right time, lest its productivity declines and there is insufficient coverage to protect against weed invasion. Five or six farmers have been provided with clumps of elephant grass. All of them have been able to provide additional forage to their cattle, and say they intend to continue growing it in the future.

Preliminary results last summer showed that milk productivity of cows fed with elephant grass alone is as high as that of cows fed with other forage grasses or with a mixture of grasses, clover, and pelleted food. It is certain, says Dr Makky, that the high productivity of elephant grass can considerably increase the meat production per hectare — perhaps even double it.

The elephant grass project has also been approved by the Ministry of Agriculture. Put together, all of these research projects may go a long way towards reducing the shortage of meat and animal products in Egypt. □

... and they like weeds too

David Spurgeon

Around the Caribbean — in Trinidad, Antigua and Belize — agricultural researchers have been busy over the past several years collecting, classifying and cultivating weeds. That might seem a strange activity for an international group of scientists, but it is serious work and its outcome could have important benefits not only for the region's fragile economy but also for many other areas of the world.

The "weeds" in fact are leguminous plants such as *Stylosanthes hamata*, which grow untended on the rocky hillsides of Antigua. The importance of such plants lies in their potential as forage for cattle.

The tiny 108-square-mile island of Antigua is in many ways typical of the situation in which many countries find themselves in this part of the world. Since the sugar-cane company left the island some years ago there has been little more than tourism and rum-making in the way of industry — and both the molasses for the rum and the beef for the tourists must be imported.

Yet much of this land, rocky and hilly though it is, could be used for grazing cattle. And if only the grass and legumes were more abundant and of better nutritional quality, the island might become self-sufficient in beef and dairy production — and even export to other countries.

The pasture legume project was begun in 1972 by the University of the West Indies, supported by IDRC funds. Now in its second phase, it has brought together experts from Australia, New Zealand, Latin America and the Caribbean, and is also providing valuable training for graduate scientists from the region.

The project has an Australian consultant, Dr Robert Burt of the Commonwealth Scientific and Industrial Research Organization (CSIRO), and is being watched with interest not only by the agricultural ministries of the three countries directly involved, who are enthusiastic in their support, but those of neighbouring countries such as Guyana, Barbados, Jamaica, Guadeloupe, Martinique and Cuba.

The Antigua component of the project is directed by a New Zealander, John Keoghan, who has taught at McGill's Macdonald College and done research at the University of Guelph in Canada. Other members of the team here are Belal Ahmed, a microbiologist from Bangladesh, Clive Devers from Guyana, a graduate assistant, and Perry Phillip, a technical assistant.

Keoghan is optimistic about the project, and sees it eventually having application far beyond this little island. All of the grasses growing in the Caribbean and thought of as "native" to the area, he says, actually come from Africa, while the legumes come from the area itself. The soil in both regions of the world is heavy clay, and if work done in the Caribbean were applied in Africa he believes it could revolutionize agriculture there.

"This is not far-fetched," insists Keoghan, and he cites the Australian experience to back his views. "This is what the Australians did. They went to South and Central America and

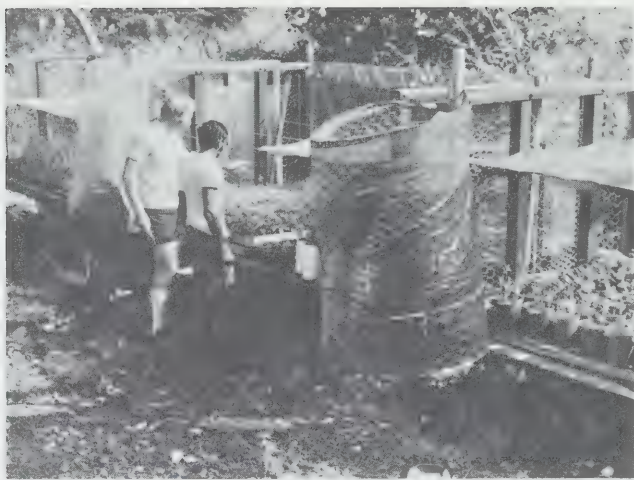


Photo: D. Spurgeon

Dr Keoghan and colleague at the small plant nursery.

found plants for Northern Australia, which is tropical. The legumes that dominate livestock agriculture in Northern Australia were originally growing as weeds in South and Central America."

He admits that there is a difference, of course. The Australians selected plants from acid soils for acid soil areas of their own. Keoghan and his colleagues collect plants from alkaline soils to match those of the dry areas where livestock graze both in the Caribbean and in Africa.

So far, they have collected a total of about 1,000 grasses and legumes for planting in experimental plots, including 70 different varieties of grasses. They are carrying out a complete classification and description of the plants, and then are making an agronomic assessment under different growing conditions, for example with different types of soils, and in mixtures of grasses and legumes.

Two experimental plots are being used, one of them near the old sugar mill, where the small amount of laboratory equipment required is also located, along with nursery facilities. As basic as all this might seem to be, it has never been done before, according to Keoghan. Although there were earlier sporadic attempts at collection, classification and description, adequate records were not kept of them and plant collections disappeared.

Pasture legumes are important not only for their high protein content, but for their ability to fix nitrogen and thus act as a fertilizer for the grasses. This latter capability is all the more important to developing countries at a time of high fertilizer prices.

Samples of legumes have been collected from all over the island as well as from other countries in the region. These are then grown in plots and later harvested.

Samples are selected from a six-square-metre area of each plot, the leaves are clipped and the yield is bagged, dried in ovens at the sugar factory and the weight measured. Nitrogen and protein content are determined, and records are kept of these measurements. Seeds are collected and examined, and then sent to CSIRO in Australia, which is the main centre of tropical legume research.

After two years of trials in these plots, the research team in Antigua is now beginning to mix the best grasses and legumes in field trials for testing under actual grazing conditions. They hope to narrow down the choice of grasses and legumes in order to determine both the best varieties for local conditions and the most productive combinations, from which they can work out the most suitable management practices.

It is painstaking work, but as any gardener knows, nothing grows so well as a weed, and unlikely as it may seem these weeds may just be the start of an agricultural revolution. □

David Spurgeon is the IDRC's Senior Science Writer with the IDRC.

THE REAL COST OF THE ARMS RACE

Michelle Hibler

The stark brochure left on the desks of the 200 or so delegates attending the United Nations Association in Canada's annual conference stated grimly: "The nations of the world have produced the equivalent of 50 tons of TNT for every man, woman and child on earth. Where would you like yours?"

It was a sobering question on a sunny Saturday May morning. But, while the delegates had not come to Winnipeg specifically to discuss armament and arms control, none questioned that the threat the arms race posed was an integral part of the conference's theme — Canada and the United Nations in a Changing World — and one of the main challenges faced by the world and the UN. The theme paper prepared for the conference had, in fact, set the problem forth in a Catch-22 fashion: increased competition to obtain weapons creates unfavourable conditions for organizing cooperative efforts to achieve a new and more just international order. And, lack of progress on a new world order can only increase tension and thus further the arms race.

In a key-note address, Dr Kurt Waldheim, UN Secretary General, underlined how dramatic the changes had been since the creation of the United Nations in 1945: world population doubled — quadrupled in some developing countries — colonial empires disappeared, population redistributed from country to city and the advent of complex new problems to be added to age-long obstacles of international mistrust and rivalry.

"We are now engaged in trying to come to terms with these changes in our way of life", he told the delegates. "Thus, where once political influence, military supremacy or economic strength were the main aim of national leadership, the leading concerns of our social and political institutions and of our best thinkers now include topics such as energy, population, food production, greater equity between rich and poor nations and the integrity and conservation of the natural environment."

But through all the changes that have occurred during the past three decades, there has been no change in the unending struggle between national interests and international responsibility. Since it was founded, the UN's primary role has been to strike a balance between them and maintain peace and security, a role it has carried out mainly through mediation peacekeeping activities — in Kashmir, the Middle East, the Congo, Cyprus and once more the Middle East. But as the arms race escalates and more members are added to the nuclear club, will it be able to continue to do so? And, is it sufficient for the UN "not to lead people to heaven but to save them from hell" as Brian Urquhart, UN Under-Secretary General for Special Political Affairs, describes the organization's role?

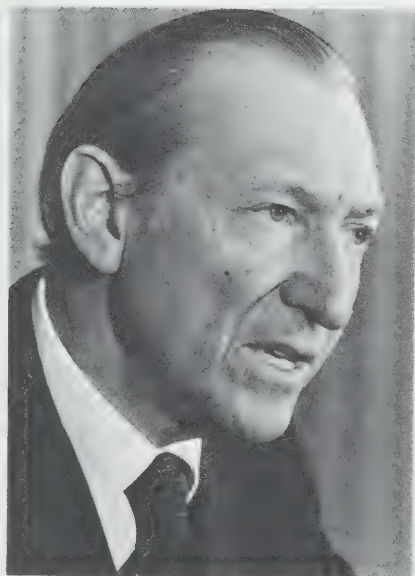
The hell — the spectre of atomic war — arrived on the scene a few months after the founding of the UN. Scarcely less serious today is the quest for increasingly efficient conventional arms. "The ready sale and transfer of arms compounds the potential for conflict which exists in the most sensitive areas of the world", says Dr Waldheim. In view of the seriousness of the problem, a special session of the General Assembly will next year be devoted to the problem of disarmament.

It is obvious that new strategies will be needed if the world is to meet the challenge of arms control. Close to \$350 billion are now spent annually on arms throughout the world, an amount more than 15 times as large as the value of all official development assistance provided to developing countries. Military expenditures by the US and the USSR together account for close to 230 billion, a figure higher than the Gross National Product of Africa.

So far, the attempts made to halt the arms race have failed. Since 1946 more than 20 bilateral and multilateral agreements have dealt with disarmament and a dozen international conferences and as many United Nations resolutions have focussed on the problem: nuclear and conventional arms have nevertheless proliferated. Says Dr William Epstein, Special Consultant on Disarmament to the UN Secretary-General: "The arms agreements only serve to legitimize the proliferation" since the ceilings are set higher than the actual number of arms existing at the time.

The real cost of the arms race is however greater than the military expenditure figures show. In economic terms, military production stimulates demand for goods and services but supplies neither, thus contributing to inflation. Immense quantities of capital, natural resources and human skills are extracted from the economy but nothing is returned. Politically, little cooperation can be expected in an international atmosphere constantly under threat of conflict. In human terms, when countries big and small are involved in big and small arms races, little time and less energy can be spent on improving the lives of ordinary citizens.

Mrs Inga Thorsson, Under-Secretary of State, Swedish Ministry of Foreign Affairs, and the main speaker on the disarmament question emphasized the close link between disarmament and the possibilities of establishing a new international economic order. Half a million scientists and technicians are presently engaged in military research, she says, research that could be oriented to development. "The absurdity of the situation is that incredible sums are spent on weapons that are not only unusable against poverty but are doubly dangerous both in themselves and because they divert resources from the struggle against want." In 1975, she says, the World



Dr Kurt Waldheim, UN Secretary General: the ready sale of arms compounds the potential for conflict.

Bank estimated that \$12.5 billion in official development assistance, annually for 10 years, were necessary to meet human welfare needs everywhere. This objective has yet to be realized although the total is less than half the annual arms expenditures throughout the world.

"We live in a continuous situation of war, in a growing state of pessimism on the possibilities of peace and development. We have reached the stage," she says, "where it must be recognized that disarmament alone, although an absolute necessity, is not enough. Disarmament for peace is no longer sufficient. What we must work for now is disarmament and development for peace."

And development, the conference stressed, is now virtually impossible without a new international economic order. Speaking of the disparity between rich and poor, Sridath Ramphal, the Commonwealth Secretary-General, called for a "dismantling of international structures of economic dominance and inequality. Tinkering with the prevailing economic arrangements — themselves a relic of the passing age of political dependency — will not suffice to secure the objective of a more equal world", he said, adding that since 1945 the world has been tinkering with the old system.

Thirty years of post-war internationalism have seen the equality of nations assured by the United Nations charter almost nullified by an entrenched economic inequality. Despite the target for development assistance set at 0.7 percent of the GNP of industrialized countries, for instance, it has fallen from 0.44 to 0.36 percent between 1965 and 1975. By 1985, Mr Ramphal estimated that the poorest will be 4,500 times worse off than the richest. And in trade the record is no better: developing countries produced more, sold more, but their net earnings declined.

The international economic system itself is at fault and needs reshaping if it is to yield more equitable returns. It is not, says Ramphal, "a time for little plans. There are times when human needs demand that change be structural and revolutionary rather than marginal and evolutionary — and that it proceed not sectorally but with universality. It is in such a time that we live."

The problem of the poor is not a problem for the poor alone; poverty debases humanity and diminishes rich and poor alike. But beyond this moral imperative, says Ramphal, is the fact that gross disparities in the human condition put at risk the very survival of the advantaged minority.

Unfortunately, says Dr Gerald Hel-leiner, Professor of Political Economy at the University of Toronto and former IDRC Research Fellow, there is ample evidence that this message has not been internalized by decision makers. Any progress that has been made has been despite the best efforts of developed countries, he says, accusing Canada,

among others, of "marching smartly backwards" by reducing the percentage of its GNP devoted to aid and by increasing import barriers and tariffs. The west has dragged its feet on such things as the common fund requested at UNCTAD IV simply because it doesn't perceive it as being in its best interest.

A reason for this reluctance, explains Paul-Marc Henry, President of the OECD Development Centre, is that the rich countries are no longer feeling very rich. Soaring energy costs, inflation, high unemployment, the high costs of capital installations and lack of investment capital had led to the tendency for the rich countries to diminish their investments in the South for the development of their own resources. But such a shift only aggravates the problems in developing countries. Unstable economies often bring about a condition of internal decay and corruption. The weaker the country's economy, he says, the greater the tendency for it to become a "hard State" stressing self sufficiency, independence and sovereignty. These countries, he warns, generally opt out of the world economy.

If the international dialogue is to continue it needs to be sustained by results — however modest — and by subsequent action. Yet, such insights seem to escape the rich countries at the level of the global community. Says Ramphal: "The truth is that the perception of interdependence comes a good deal easier when it reinforces commitments the rich seek (such as supply) than when it prescribes change they would rather resist (such as prices)."

The danger, of course, is that it may be deferred too long. Indeed, he asks, "why should the poor avoid catastrophe and leave the rich rich?"

Needed is a new deal on commodities and credit, a redistribution of manufacturing capacities, access to markets and resource transfer. The "planetary bargain" sought by the Third World involves no losers, says Ramphal, although the North is being asked to give more than it will receive directly or immediately. In the long run, however, improvements in standards of living in developing countries will improve those in developed countries by creating new markets. Future growth and future jobs in western countries depend on enlarging the purchasing power of those markets. To do so will require orienting research and development away from defense towards the satisfaction of basic needs.

Although the UN was not created for resource transfer, it offers the machinery to tackle these problems. But, says Dr Waldheim, "the energy to drive this machinery can only come from political will, the will that must be at the heart of all to do so."

The difficulties ahead in achieving these goals cannot be minimized. A first step has been taken in most developed countries by various groups who are

informing citizens on the issues involved in a new international order. The increasing consciousness of the need to adopt a conserving society is having its effects on policies through such groups as the RIO Foundation (Reshaping the International Order) based in Rotterdam and the Dag Hammarskjöld Foundation of Uppsala, Sweden. And conferences such as the one held in Winnipeg, are contributing to the awakening of awareness that a global perspective is needed, that no problem in the world today can be solved in isolation, and that there can only be one answer to the question of "where do you want yours?" — reoriented towards sustaining growth and employment in the developing world. □

A national voluntary organization, the United Nations Association in Canada aims to study international problems and Canada's role in the UN; foster understanding and cooperation between Canadians and peoples of other countries; study possible courses of action and seek public and governmental support for policies advocated by the UNA; and disseminate information, organize education programs and stimulate interest in the UN and its specialized agencies. Its president, at the time of the Winnipeg conference, J. King Gordon, is Senior Advisor, University Relations, IDRC.



The question of water supply has acquired sudden prominence in the world's news media over the past year-and-a-half, thanks mainly to two major international conferences. But the problem is by no means new, nor is the solution as simple as slogans like "Water for All" might suggest.

On the following pages, an examination of the water supply situation and its relationship to health, economic, social, technological and other factors.

What do bullock carts have in common with water pumps? More than you might think . . . read on.

Water supply needs an integrated approach

Michael G. McGarry

At the United Nations Conference on Water held in Argentina last March, a great deal was said about water supplies and the need — if not human right — for safe reliable water within reasonable access to all. The UN Water Conference was preceded by Habitat out of which came the recommendation for clean water for all by 1990.

The justification for setting a target requiring \$30 billion per year over the next 14 years hinges largely on health, the prevalence of enteric infections and other water-related diseases in developing countries, and the ability of improved accessibility of safe water supplies to combat these diseases. In the eyes of the so-called "developed society", clean water is seen as a prerequisite for comfortable healthy living. This is feasible because acquiring water takes up only a very small percentage of the American or European income, and the thought of a cholera or typhoid epidemic running through New York or London via the water supplies is truly horrific.

There is a serious danger that we the "international water engineers" will transfer such concepts and practices to developing regions where such diseases as cholera and typhoid are com-

monplace, indeed endemic; where their normal transmission routes have little to do with the water supply, and where the people simply cannot afford to pay for water supplies. These regions tend to accept external help, and with it externally determined development priorities that may have little or nothing to do with their real needs.

On the other hand, there are areas which are in dire need of improved water supplies, where during the dry season the woman must spend a good portion of the day walking as much as 10 kilometers to scrape water from a muddy hole. These water-scarce areas justifiably demand first attention but this justification is based on labour and time-savings, not on health.

There is too great a temptation for the politician, the UN delegate, the aid agency employee, the international consultant and water engineer to simplify and generalize the solution using water as a panacea, and climb on the next international bandwagon with such catchy phrases as "Clean Water for All"! It's just not that simple. If limited finance and even scarcer human resources are to be effectively spent on improving health, we must recognize that water delivery is

only one element in a complex matrix of activities which must go on if it is to have any significant effect on health at all.

The idea of clean water, plentifully available in an otherwise destitute rural village is highly attractive to the politician. It also appeals to the international bank, UN agencies and aid organizations who are now searching for ways to direct their efforts towards rural development. As a result, rural water has risen from a point of relative obscurity and shoe-string budgets to a pinnacle of international publicity — with the likely result that large sums of money will be channelled into programs that are ill-equipped to cope with them.

Despite their good intentions, international aid organizations are seriously constrained by their lack of real contact with rural peoples of the developing countries; their very nature has kept them confined to a "top down" approach and separated from the very peoples they now wish to assist. They are in the main limited to participating through financial and technical assistance and are thus highly technology oriented.

The result of all this will likely be the release of large sums of aid funds to

Better planning is the key

Bob Stanley

Advocates of rural water supply programs often base their arguments on the potential improvements to health, agriculture and the local economy that a clean water supply will bring. A recent study in Lesotho, however, has shown that the country's water supply program has brought none of these benefits.

Says Dr Richard Feachem, a public health engineer who spent two years in southern Africa evaluating water supply programs: "Our studies in Lesotho demonstrated no measurable economic benefits from the rural water supply program at all. No benefits to health. No benefits to productive agriculture or other activities." In fact, he adds, the only measurable benefit was the considerable savings of women's time, since they no longer had to spend hours each day carrying water.

This is an important social benefit, says Dr Feachem, and the lack of other benefits in no way implies that improved water supply is not worth building. "It demonstrates, however, that water supply in isolation does not provide any other benefits."

What is needed, says Feachem, is better planning. It is necessary to educate the people in matters of hygiene and proper use of water. The Lesotho study, for example, found that villagers with access to an improved water supply do not use any more water than others (a finding that is borne out by similar studies in East Africa). So the hygiene doesn't improve, the transmission of "water-washed" diseases doesn't change, and the net result is no improvement in health.

It is also necessary to provide training in the maintenance of the water supply system. Otherwise, says Dr Feachem, it will be only a matter of time before the water supply breaks down, the villagers go back to using their old polluted water source, and everybody's time and money will have been wasted.

The breakdown problem is often complicated by the fact that many African countries have gone for self-help and community participation in water supply, says Dr Feachem, and in doing so have passed on to the villages responsibilities that they are not set up to cope with. Governments too often have not thought out which village institutions should be responsible for what, and what it is reasonable to ask them to be responsible for.

Governments also expect that if the village helps to install the water supply it will also maintain it. This is the classic argument in favour of community development. In fact, says Dr Feachem, the reverse is often true. The villagers believe that, because they have contributed both time and labour to install the system, and paid part of the cost, then the government should maintain it, not them. "This was put to us forcefully time and time again," he adds.

Finally, says Dr Feachem, it is often simply a case of expecting too much of the people. "Villages in Africa are often asked to take on far more than a village in Europe or North America has ever been asked to do.

"Many of the things a village in Africa has been asked to do would certainly not get done if you asked a village in England to do them. We have documented precisely the same inability to carry out certain routine functions in villages in England as in Africa."

provide inducement for a more rapid expansion of rural water delivery programs in developing countries. Money in this context implies technology, and technological solutions will be sought and pressed into service to meet the construction targets set by the funds being made available. Unfortunately there is a severe shortage of experienced manpower capable of implementing effective rural water delivery programs in both the donor agencies and recipient countries alike. This, coupled with the inherent difficulty of successfully introducing any kind of technology to the rural community will likely result in gross errors and financial resources being wasted at high opportunity cost. Worse still, as experience in Africa has shown, the villager will become disillusioned and skeptical, even resistant to future efforts by his urban counterpart to improve his lot.

At the risk of over-simplification, we can broadly classify rural communities into three groups according to their accessibility to water and the approach which may be taken to improve the supply of water.

In the first group are the rural villages without adequate access to a year-round supply of any kind. These are termed the water-scarce villages where during the dry season water must be carried over a distance of several kilometers. Water is badly needed in whatever quantity and quality. Benefits to be accrued are largely in terms of labour and time savings, not health. These communities clearly view accessibility to water as being their highest priority and should be dealt with first.

The second type of community does have perennial alternative water sources within reasonable access. Given free choice, they would likely choose other development priorities than improving their existing water sources. Not surprisingly the vast majority of rural communities fall in this category. Consider the village which has for centuries collected water from a nearby stream during the wet season and when it dries up draws water from deep dug wells, also within easy access. As far as international standards are concerned, all these sources of water are heavily contaminated — but life goes on regardless. Then clean water is brought to the village; a hand-pump is installed. It is accepted and used, but the women and children collect the same amount of water as they did before and in the same containers. Daily routine doesn't change and the buckets and household containers are just as contaminated as they were before. Faecal contamination of household utensils, clothes, hands and food persists; the smaller children continue to defecate indiscriminately around the household. The nearby stream and wells are also used for water supply as they have always been as far as any one can remember.

Then one day a metal pin on the pump breaks and it falls idle. There is no perceived need to request its repair. Even if there were, who would the villagers ask, and what would be the response? No one is noticeably worse off by the pump's introduction and failure. The village is unaffected; the engineer and his administrator can chalk up yet another water supply installed — but at what cost? The price paid is in the wastage of scarce manpower and financial resources, the misconception that rural development has been enhanced and in the skepticism engendered and confirmed in the villagers perception of the government's ineffectual "assistance".

The third grouping encompasses the rural town which may or may not be water-scarce but which is large and organized enough to be directly accessible to the central government water supply implementing agency. Here the top-down approach can be taken. Piped water to the household is usually the objective, a committee or municipal department can be made directly responsible to ensure continued maintenance of the system and collect water rates to pay for maintenance and extension costs. Here health benefits are likely to accrue, water is being made plentifully available inside the home. Water-use practices will change and sanitary education is relatively easy to effect. The rural towns are and will continue to be serviced first. They are attractive to outside funds in terms of accessibility, capacity for repayment of loans, potential health benefits and ease of centrally coordinated management.

The water-scarce village will also be given priority, but there exists no capacity to maintain the tubewell or piped water system, the villages are most often over a day's journey over rough roads away from the central point of administration and supplies. Here the top-down approach is highly susceptible to failure. Examples of clogged well screens, broken hand-pumps, seized diesel engines, burst pipes, and defunct standpipe taps are commonplace throughout the country where the top-down approach is taken.

Up to this point I have been somewhat critical, even cynical in highlighting the pitfalls of implementing water and sanitation programs in rural areas. There are some success stories: in Malawi for example, village participation was the key to success in bringing piped water to over 150,000 villagers falling in the water-scarce category at a cost of less than \$3 per capita. The engineer, backed by the Department of Community Development and Social Welfare, began on a small scale by physically demonstrating that one could transport water through pipes from a perennial mountain stream several kilometers away. Convinced, the villagers participated by digging all the trenches, laying the pipes

and constructed the concrete aprons and soak-away pits around the village taps.

This initial demonstration mushroomed, soon the demand for piped water outstripped the capability to deliver. The "barefoot engineer" concept was introduced in the form of rural water technicians for the ever-expanding activity. Three-week technical courses are conducted for carefully selected technically oriented men with limited education. This training also includes a major community development component. Initially the piped water projects were small in size, making use of demonstrations and examples so that the villagers knew exactly what they were getting into. Now, large public meetings are held to ensure that any commitments being made are fully understood and acknowledged by all. More importantly, this approach involves the people not only in construction but in decision-making roles so that they are, to a large extent, responsible for the success of the system and willing to take on its continued maintenance and repair.

The community development approach taken in Malawi took a decade of patience, understanding and hard work to achieve. It is a clear cut example of success; unfortunately the urgency with which international funds will have to be spent, the commercial drive of equipment manufacturers and the inexperience of agencies in dealing with rural peoples are likely to result in no heed being taken.

It is the need for the bottom-up approach in rural villages that poses the greatest barrier to the national water authority's effectiveness. Such authorities are typically staffed by engineers, economists and administrators not by sociologists and community

development officers. Inherently, they operate through the medium of technology and by past experience they are urban systems oriented. With few exceptions, recent experience has revealed their incapacity to reach and interact effectively with the rural village. Some other mechanism capable of operating at the village level is needed. In principle, community development departments are well suited to the task of ensuring village participation and commitment, but in many countries they are relatively ineffectual and lack the technical capability required to design and construct water and sanitation systems, nor are they health oriented.

I would like now to take up the role of primary health care programs in improving rural water supply and sanitation in rural areas. We are well aware of the shortcomings of many conventional health services of developing countries in which emphasis has been on creating sophisticated centralized medical services, the training of highly competent qualified medical personnel and an orientation towards curative medicine practices. The outcome is a rigid and over-centralized urban-oriented administrative superstructure which, although purporting to serve the rural poor, lacks the necessary ability to reach out to them.

In attempting to meet the challenge, a few countries have undertaken commitments to the rural poor and given real priority to rural health care services. These include China, Cuba, Tanzania and Vietnam. Each system of primary health care differs in response to the varying needs and conditions of the community and country. There are some common characteristics, however, some of which would be of use in rural water



Photo: Brian Grover

Fetching water from a communal standpipe: water supply, sanitation and health care programs must be part of a single package if they are to be truly effective.

WANTED: a better hand pump

David Henry

supply and sanitation programs. Primary health care activities may be centrally coordinated but they are locally controlled. Action takes place at the village level, the chief functionaries remain and work in the community, are responsible to it and preferably have been brought up there. Thus a source of education and information is always available to the village. Any technology introduced as part of the primary health care program can be maintained and is regarded as belonging to the community it serves.

Primary health care programs have been shown capable of reaching the village with basic environmental improvements. Unfortunately relatively few countries have thus far benefitted in this way. In other areas many low-cost health services projects are operating on a small scale and will serve as models on which national health care programs will be based. Few are engaged in improving excreta disposal and water supply and facilities as a result of lack of technical expertise, and thus confidence, in this area.

We are, I believe, at the beginning of a rapid expansion of rural health care programs. If they truly are, as they purport to be, "preventative" in orientation, then technical expertise in water and sanitation will have to be integrated into their activities and training programs. Conversely, if the poorest and remoter villagers are going to benefit from the coming surge of emphasis on water, we will have to look to the emerging primary health care programs as the most important mechanism of implementation.

If we are to speak of the importance of water supply, proper excreta disposal and hygiene, improvements to health and the need to implement such activities in rural areas of developing countries, they must be viewed together as components of a "sanitation package". If each component is left to be implemented separately, the potential health benefits are seriously constrained, if not totally lost.

The question is not how many water supplies can be installed over a given period of time, but why and how they are implemented, to what effect, and most important of all, at what opportunity costs? □

Dr McGarry is Associate Director, water supply and sanitation, with the Centre's Health Sciences Division.

Any water supply system is only as good as its weakest component — and in rural areas of the Third World the weakest component is usually the pump. The reasons are simple: most hand pumps were designed long ago and far away for use in a completely different environment.

Over the past 100 years or so the basic design of the hand pump has remained virtually unchanged. What is badly needed is a better machine, and a group of scientists at the University of Waterloo, Canada, are hoping they may have it. With the support of an IDRC grant, the team at Waterloo — composed of senior members of the engineering faculty with backgrounds in physics, fluidics and chemical engineering — has been working on the problem since the beginning of the year. Their objective: "to optimize the design of a piston and check valve configuration for use in low-cost rural water pumps."

What they hope to produce is a pump that is reliable, tough, inexpensive, requires no specialized maintenance, and can be adapted to local manufacture. The exercise has focussed primarily on the use of various plastics, as opposed to traditional materials such as bronze, brass, cast iron, and mild steel. Plastic injection moulding techniques could result in considerable savings in manufacturing costs, and many developing countries already have the basic injection moulding capacity to produce pump components.

Given these guidelines, the researchers developed and tested a number of different design configurations in the laboratory. These prototypes are capable of being adapted to high, medium and low lift, and will be manufactured in four sizes, from 1½ to 3 inches diameter. This flexibility will allow the pumps to meet the wide variations in factors such as aquifer characteristics and population distribution that will be encountered in actual use.

The prototypes with the best performance record under laboratory conditions have now been selected for extensive field testing and research. Discussions are currently underway with five countries already engaged in pump development with a view to organizing a two-year testing program that will feed back into the design exercise the actual field experience. In this way further modifications can be incorporated if necessary.

One of the major parts of the field research will be to develop more effective driving mechanisms using local materials. The most common cause for breakdown of the traditional cast-iron pump is the rapid wear and tear at bearing points. The developing country researchers will study various types of woods as an inexpensive and easily replaceable alternative material for bearings.

The decision to investigate the applicability of local woods for bearing was based in part on the effectiveness of wooden bearings in machines such as bullock carts. Such carts in India, for example, run on wooden bearings, and carry more freight each day than the Indian railways! The researchers also discovered that in fact the North American petrochemical industry imports African hardwoods for use in the manufacture of high-stress bearings.

All field research teams will use a uniform guide for conducting pumping tests that will enable easy comparison of results. Progress reports will be prepared periodically during the two-year testing period, and disseminated as widely as possible. The one major question still to be dealt with is the most effective method of getting the new pump into the marketplace once the optimal design has been determined. That is something that will have to be decided during the next two years, and any suggestions will be welcomed.

David Henry is Assistant Director of the IDRC's Health Sciences Division.



The options are limited

A preliminary report on a review of appropriate waste disposal technologies for developing countries carried out by Witold Rybczynski, head of McGill University's Minimum Cost Housing Group, Chongrak Polprasert, of the Asian Institute of Technology, Bangkok, and Michael McGarry, associate director of the IDRC's Health Sciences Division. The review, now completed, will be published by the IDRC at a later date.



Hand pump: its basic design has remained unchanged for perhaps 100 years.

The situation in which the developing countries find themselves today with respect to sanitation parallels in many ways that of the industrialized countries at the turn of the century. The questions to be asked are: To what extent is the situation similar? To what extent are the options similar? And hence, is the waterborne option adopted by the industrialized countries the optimal choice for the developing countries?

The industrialized countries at the turn of the century found themselves with rapidly growing cities and traditional sanitation systems (cesspools, pit latrines, open ditches) which were inadequate to the new scale of population. The results were high disease rates and poor environmental conditions. So far this parallels closely the situation many developing countries face today, but here the similarity ends.

Most of the cities in the United States, for example, had running water in the houses (and water closets) before they had sewers, and in fact the sudden availability of large quantities of water was part of the reason for the breakdown of the previously adequate cesspools. This is generally not the case in the poor areas of developing country cities, and hence the option of on-site dry systems, not available to the nineteenth-century American cities, is clearly an alternative for the developing world. The second major difference is that nineteenth century America and Europe were in the midst of an economic growth period of unprecedented proportions. It is obvious that this is not the case with most developing countries, and clearly this will limit their options.

The options for the nineteenth century American cities were coloured by the ready availability of large quantities of water. Since this could not be infiltrated on-site, it had to be transported away. The transportation of sewage by truck was seriously considered, and tried, in America. The organizational capability proved to be beyond the ability of the municipal governments of the time. European cities, better organized, did use bucket systems. In some cases (Copenhagen, Stockholm) well into the twentieth century. Present-day literature confirms that in countries with a high degree of social organization (Korea, China, Japan) carting of nightsoil is successfully practiced with little apparent health hazard, and significantly lower costs than sewerage systems.

Septic tank systems (including aquaprvies) were not invented until 1897, and perfected only some 25 years later. Consequently they represent a "new" option. Although often cited as an appropriate solution for developing countries, there is evidence in the literature that high cost and operating problems (due to water availability) have limited the success of this technique. Once again it should be remembered that the septic tank is a solution to

handling rather large quantities of water, and generally presupposes a water closet.

The third option for developing countries is dry on-site treatment. The most simple form of this is the pit privy. It is surprising to find that although this is probably one of the widest used excreta disposal technologies, there is very little technical literature on the subject. There is evidence, however, that the infiltration effects of pit privies are limited to quite a small area, and the application of the pit privy, in some improved version, to urban conditions is by no means out of the question. There is literature that indicates that long-overdue improvements in ventilation and construction can significantly improve hygienic and environmental characteristics.

The main drawback of pit privies is their reliance on particular soil conditions and a low water table for proper operation. One of the options that was discarded in the nineteenth century was the dry earth closet. The literature shows that in the last decade there has been renewed interest in dry long-term decomposition in closed containers as an on-site excreta disposal system. These are sometimes called composting toilets, but more accurately ought to be called "mouldering" toilets. Vietnam is reportedly making a large-scale sanitation effort based on on-site decomposition of nightsoil, and Tanzania has been conducting a research program in this direction, partly assisted by an IDRC research grant.

These dry on-site systems have application only in single family dwellings, and hence are certainly a solution for most slums and marginal settlements. At present, however, there is no evidence of similar systems that could be applied in high-rise or communal housing. For the moment at least, it seems that removal — either by cartage, vacuum truck or sewers — will have to be the solution. However, there is a growing body of literature that indicates that many possibilities exist for re-use of sewage and nightsoil, and that economic implications of such re-use could reduce the cost of sewer infrastructure where the latter is unavoidable. Techniques include composting of nightsoil to produce fertilizers, and the utilization of oxidation pond effluent in aquaculture, algal culture and irrigation. Some of these practices are reported to be taking place on a large scale, others on a more experimental basis. □

CHINA the people move mountains to bring water

Clyde Sanger

This has been the year when the governments of the world turned their attention to their peoples' needs for water. In March they met at Mar del Plata, Argentina, at the United Nations Water Conference to discuss how to establish sound policies of water management at national and regional levels.

Then in August in Nairobi the focus was on those areas of the world where shortage of water is most acute. The United Nations Conference on Desertification had, at every turn, to face the truth that if the world's arid and semi-arid regions are to become more habitable and productive — in other words, are to be saved from becoming deserts — every skillful idea has to be used to provide these regions with water.

The work is still not finished: cutting a way through the rock to bring water to the rest of the county.



Photos: Clyde Sanger

The delegates to either of these conferences might have done well to learn about — much better still, to visit — Linhsien county in Honan Province of central China. For they would have seen an inspiring example of what can be done when a group of people become determined to end their years of poverty and to harness whatever water resources are available for everyone's benefit.

A first lesson for the delegates is that it requires long, hard work. It took 10 years for the able-bodied young and not-so-young people among the 700,000 population of Linhsien county to build the Red Flag Canal and all its branch canals, channels and irrigation ditches — some 1,500 kilometres of waterways. But, seven years after the canal's completion, it is possible to see what a transformation it has brought to the life of nearly everyone.

In the old days it was known as "the county of the four poors — poor mountains, poor water, poor fields and poor people". Exactly a century ago, a tablet was set up to mark the severe drought of 1877 and part of it reads: "... people kept alive on persimmon leaves and red soil. They sold their daughters for a few coppers. Deep unrest prevailed. What life was like during this natural calamity is engraved here in stone so that all will remember it."

These conditions continued. Our guide in Linhsien county, Liu Teh-ming, told us he fled in 1936 at the age of seven into another province to escape famine, while his sister was sold to rich people. One of the heroes of the canal construction, Jen Yang-cheng, was given that name, which means "nurtured by sheep", because he was born in a year of drought when adults weakened and starved, and his milk-less mother saved his life only by taking him each night to the landlord's sheepfold and finding a ewe that could give him some milk.

After Liberation, which came as early as 1944 in this area because Mao Tse-tung's armies had a strong base in the nearby Taihang Mountains, efforts began to improve water supplies. These efforts seemed ambitious at the time: many deep wells to provide irrigation, three large reservoirs and finally the 10-km Hero Canal out of the Taihang Mountains on which 8,000 people were mobilized to work. But in 1959 there was a more than usually severe drought; the canal dried up and the reservoirs were almost empty. Clearly they had not done enough.

Next year they took a deep breath and tried something far more ambitious. They decided to take water from the Changho River, which flows out of Shansi province and is the boundary between their Honan province and Hupeh province to the east. In order to build a gravity system and avoid any expensive pumping operations, they had to go 20 kilometres into Shansi province and divert river water along a canal they

would build on the contour around and sometimes through precipitous parts of the Taihang Mountains.

The Chinese do not hide the fact that the first weeks of construction were chaotic. The Party committee had hoped to finish the 70-km trunk canal in 80 days and have it ready for May Day 1960, by mobilizing 100,000 peasants to dig one metre each. But, as one account records, "when the number was around 37,000, the road became jammed with people and carts. . . . There was great difficulty in getting materials to the right place and in time, and there were not enough technicians and administrators to direct the work. . . . Some people even dug in the wrong places. Little headway was made on the project during the first 20 days. . . ."

Gradually they sorted themselves out. But, once inside Honan province, they faced their toughest obstacle: a granite cliff through which they would have to dig a tunnel more than 600 metres long. To do it, they had nothing except steel rods and sledgehammers and explosives that they made from finely ground ammonium nitrate fertilizer. The government in Peking was preaching austerity after three bad harvests, and gave them no help.

The Youth Tunnel, built by 300 handpicked young men and "iron girls", took 15 months to complete. It was here Jen Yang-cheng proved his heroism, dangling over the cliff-edge in all weathers to dislodge rocks loosened by blasting. Today he has the anticlimactic job of maintaining the tunnel and talking to visitors.

It was not until 1965 that the 70-km trunk canal was finished. From the diversion lock at its terminal spread out three main branch canals, the largest of them carrying water another 41 km south, with a flow of 14 cusecs. When the system was completed in 1969, it could irrigate 40,000 hectares of farmland, or two-thirds of the whole county.

What has it meant to the people? It has meant new crops. In the past they grew mostly millet and maize, and worried about the uncertainties of rainfall which reached 800mm only in a good year. Now they grow wheat, cabbages, cotton.

It has meant hydroelectric power. Not in large power stations, but by using the water several times over (we saw a series of 23 tiny plants, each generating 40 kilowatts, spaced down a sloping road) enough power is generated to bring rural electrification to the county's 500 villages. It also powers medium-sized industry: an iron and steel plant, a farm machinery factory, as well as threshing and milling operations in several places.

It has meant fruit orchards and trees on the mountainside to stabilize and improve the soil. Linhsien county means literally "forest county" and its name is only now regaining some truth.

Work has not ended for them. Plans are advanced to bring irrigation to the southern third of the county. When the summer crops are harvested, work gangs go out to level the land further so that agriculture can be mechanized and, in some areas, a third crop (perhaps winter wheat) can be grown in a year. Before the Red Flag Canal was built, average grain production per mu (one-fifteenth of a hectare) was 200 kg in a good year. Today it is 350 kg, and the county can sell more than 22,000 tons of surplus grain to the state. But county leaders say they can improve on that figure.

Living is still quite spartan in Linhsien county. The number of handcarts piled with cabbages, being hauled to market in early morning by young girls, attests to that. But it is far better than in the youth of Liu Teh-ming and Jen Yang-Sheng.

They will quote you Mao's saying, "Poverty forces people to make changes." They also like to recall his 1945 article on "The Foolish Old Man Who Removed the Mountains". For they did the same. □

Tiny hydroelectric plants bring power to 500 villages.



Clyde Sanger, Associate Director with IDRC's Publications Division, visited Linhsien county while in China late last year. This article was originally published in the IDRC Features series, a monthly news feature service on scientific, technical and educational subjects which is distributed free of charge to selected newspapers and magazines in the developing world. For more information write: IDRC Features, P.O. Box 8500, Ottawa, Canada, K1G 3H9.

The Changho River: diverting its waters through the mountains to Linhsien county took hard work and heroism.



Blending the old with the new

Jean-Marc Fleury

Nigeria, Africa's most populous nation, is undergoing another period of intense political activity. But, almost a decade after the civil war that threatened to break the country apart, it is peaceful politicking. The talk is of development, not secession, of ballot boxes rather than guns. The number of States has been increased from 12 to 19. A new constitution is being drafted. Thousands of councillors have been chosen to direct brand new local government structures. And, more recently, all traditional communities had to nominate chiefs whose solemn faces appeared in the country's newspapers.

According to Lieutenant General Olusegun Obasanjo, head of the Nigerian military regime, all these efforts are aimed at reestablishing democracy on a firm footing in Nigeria before October 1979.

In the midst of all these changes, one reform could interest other African countries according to observers: it is the creation of new regional governments based on the participation of citizens and the collaboration of traditional rulers. The Nigerian military regime has set as one of its priorities the creation of local governments, which will become intermediaries between the traditional authority and the State governments.

The establishment of local governments is an innovation in Nigeria, whose regional administrators were, until recently, modelled on the British colonial system. Each State of the Nigerian Federation was broken down into divisions, each directed by a government appointed District Officer. Divisions were simple administrative extensions of the State government. After independence British District Officers were everywhere replaced by Africans, but there was still no provision for the participation of local citizens.

But now Nigeria has decided to experiment with new regional structures. All divisions and District Officer positions have been abolished and replaced by councils which blend citizen participation and the extension of State authority. Up to 25 percent of the local government's councillors can be nominated by the States, the other members of

the council are directly or indirectly elected by the people. (Indirect elections are decided by consensus). Lieutenant General Obasanjo himself insisted that geographic areas under each local government should bring together a sufficient number of people and enough resources to become an effective agent of development. But at the same time, local government units will remain small enough for the councils to respond to the needs of the local population. Local governments will also work closely with traditional chieftaincies in order to bridge the gap between the modern and the old structures. General Obasanjo has also expressed hopes that the local government elections will become a way of learning the democratic process at the grassroots level, ensuring the success of democratization at the national level.

In preparing all these reforms, the military regime first sought the opinions of the people. The large Nigerian intellectual community responded overwhelmingly by submitting many suggestions to be incorporated in the new constitution. Important among these was the study of the regional governmental structures of three states conducted by a team from the Political Science Department of the University of Nigeria in Nsukka, headed by Professor Eme O. Awa, and supported by the IDRC.

Professor Awa's team reviewed the regional administrative structures of East Central State (which has been divided into two States: Anambra and Imo) and South Eastern State (now Cross River State). The team's reports, published in 1975, before the military regime's own "Guidelines of Local Government Reform" were published in the summer of 1976, included many recommendations for the organization of the new local governments in these three new States.

During the Cross River survey, the researchers first examined the workings of the divisional administrations introduced by the State government. Although these new administrations had just been created when the survey began in 1975, the researchers noted that the Division Officers, the leading government officials in each division, were not fulfilling their role. According to law, each division was responsible for pro-

moting agriculture, encouraging the establishment of small enterprises and helping business. The field study showed, however, that agriculture was generally set aside and that Officers confined themselves to administration routine. Left to their own devices, the traditional communities were initiating many development projects, mainly concerned with services — roads, schools, post offices, hospitals and markets. Traditional rulers often played a first-hand role in these accomplishments, with the result that relations sometimes deteriorated between the Officer and traditional authority.

In general, the study concluded that traditional structures seemed to be more useful to the people than those set up by governments. The researchers therefore felt that any study of local government would need to study traditional institutions before new regional structures could be planned.


The University of Nigeria team, directed in the field by Professor Mazi Ray Ofoegbu, therefore began its study with an in-depth evaluation of traditional authority. In the course of this study, they discovered that some controversy existed about the legitimacy of traditional rulers, although the chiefs still enjoyed considerable prestige. Some of the people interviewed said that the age of chieftaincy had passed. According to them, traditional authority had been devalued because some chiefs were self-appointed usurpers who had profited from the departure of true chiefs as a result of the civil war. Also, before independence a number of rulers had been named by the colonial government, against tradition. And, more recently, some successful businessmen had literally bought the title of chief.

Nevertheless, the University researchers found that 90 percent of the people wanted the chiefs to remain. Even a large majority of State-appointed District Officers were in favour of keeping the chiefs. When asked why chieftaincies should be maintained, a first reason given was the role chiefs could play in the administration of justice and the keeping of law and order. Some said that each community needed a "father figure" and that without it the communities themselves would dissolve. Others said the chieftaincy was an institution that had to be preserved for future generations because it added a human touch to structures of authority and guaranteed the survival of traditions. Still others acknowledged the fact that chiefs combatted corruption, favoured the collection of taxes, and that by obeying them, citizens learned to respect the laws of the country.

The survey also emphasized the role of the chiefs as agents of progress. For example, the agaba ogbusulu (chief) Okechikelu Constantinu Manu, chief of Aku (near Nsukka) since 1938, likes to say that he invited missionaries to come

Summit December 1, 1979 WEEKLY STAR 19

INSTALLATION CEREMONY AND FIRST OFALA OF



Chief Ezedioramma Ositadimma Umenyiora I The 1st Igwe Of Ogbunike

His Royal Highness, Chief Ezedioramma Ositadimma Umenyiora I, The Umenyiora Family, The Installation Committee of the First Igwe of Ogbunike, the entire Ogbunike Community cordially invite all citizens of Anambra Division, Anambra State and the Federal Republic of Nigeria to large to the Installation Ceremony and the First Ofala of CHIEF EZEDIORAMMA OSITADIMMA UMENYIORA I AS THE IGWE OF OGBUNIKE on Sunday, December 23, 1979, at the Round House, Ogbunike, beginning at 9.00 a.m. prompt. All sons and daughters of Ogbunike at home and abroad are hereby requested to obtain further details from the Ogbunike Progress Union, The Ogbunike Mass Return Committee, The Ogbunike Council of Notables, The Ogbunike Youth Association and of course the Installment Committee of the 1st Igwe of Ogbunike.

OGBUEFI DR CHUBA OKADIGBO,
(Chairman)
INSTALLATION COMMITTEE,
CHIEF'S VILLAGE,
OGBUNIKE.

The people's choice: solemn-faced chiefs appear in the country's newspapers.

and build schools in his city, as early as 1945. He then enacted a policy of free education for everybody. He also remembers mobilizing, through contributions, a sum of 5,000 pounds for the boring of a well. Recently, he supported the construction of a college and launched a number of road construction projects. In the same way, Mr Patrick E. Onwege, Nsukka Urban Council's President, tells how his father, the chief of Mameze (another locality near Nsukka), once gave some of his land for the construction of the university, and invited priests to come to Nsukka to construct a church and a school. In fact, history shows that chiefs often competed with each other to attract missionaries and teachers, and that they were the first to send their children to school. On this evidence, the study concluded that it would be false to think that the chiefs' role was limited to maintaining traditions. They were, and could still be, an important factor in the process of modernization.

To maintain law and order, for example, the chief can enforce customary laws in accordance with modern pre-

cepts in order to settle disputes between husband and wife or quarrels over land ownership. Chief Constantinu Manu says that people prefer to put such problems before him. His assets are his great availability to the people and his knowledge of traditions, that help him to practice a justice more relevant to his people than that enacted by a European-trained magistrate. Candidates to Nsukka's local government, like Mr Lawrence U. Asadu and Mr Jerome Oziodko, also wanted the chiefs to continue to enforce the customary laws. They think, like chief Manu, for example, that chiefs should sit on First Instance Courts to interpret the customary law.

The researchers largely endorsed chief Manu's suggestions, and recommended that the modern chief assume a broad range of responsibilities not only in the judiciary, but also in the political, sociocultural and economic spheres. The economic responsibilities of chiefs, for instance, would be assumed in close collaboration with local administrations because it had been found in the past that the support of the traditional rulers had often made the difference between

success and failure. As an example, Professor Ofoegbu tells the story of a road project that was on the verge of being stopped because of a lack of fuel oil for the equipment. Neither the District Officer nor the President of the Regional Council at that time could find oil. As a last resort, the people went to the Obi, the village's chief. Two hours later, two barrels of fuel oil were delivered. He best knew the resources of his people!

The researchers, however, believed that despite its importance, the institution of chieftaincy was not adequate to undertake many of the development projects needed in modern Nigeria and that its limited resources could not guarantee the success of large-scale projects. The creation of a structure grouping many communities, situated between the traditional authority and the State government appeared to be essential. In some regions, mainly in the North, it was true that populous traditional communities coincided with regional divisions, but most of Nigeria's traditional communities could not gather enough resources to become powerful agents of development.

The University team therefore recommended that another structure, to be called Local Government, should be established to bring together many communities. According to the researchers, that structure should bring together from 50,000 to 200,000 people, a large enough grouping, but not so large that contact with the citizens would be lost. They also recommended in their report that the Local Government should make a considerable effort to obtain the collaboration of the traditional rulers.

The military regime adopted these recommendations in its "Guidelines of Local Government Reform" by officially recognizing the institution of chieftaincy. Each community was asked to choose a chief, in its own way, and the government declared that each chief would receive an annual salary of 1200 nairas (\$2,000). In return, the government now expects that chiefs will continue to support development projects and collaborate with the new local governments.

Established at the end of last year, these Local Governments are those recommended in the University report, gathering from 150,000 to 800,000 people, a bracket brought down to 100,000 and 350,000 in Anambra and Imo States, where people are used to living in smaller communities. But while Nsukka's political scientists had recommended that the new local authority be a two-tier government — the first tier being the regional council and the second, the rural or urban communities — the Federal government decided on a single tier Local Government in which the communities are subordinate to the Local Government Council because it

felt that this integration would ensure an even closer collaboration between the old and the new structures. Traditional rulers will, in fact, be mainly ad hoc councillors in different matters, for example, to the First Instance Courts and to Local Governments for the undertaking of economic projects.

In Nsukka, one colleague of the researchers compared the new Local Government to the urban communities that are being established in European countries. In Nigeria, the Local Governments will be responsible for health centres, primary education, the implementation of new agricultural techniques, water and sewer mains, roads, and the collection of taxes. Initially, it was expected that some of these responsibilities would be assumed by the State Governments. However, immediately after their establishment, some Local Governments had already started to collect taxes and to dispense primary education.

Concerning tax revenue for the Local Governments, the federal government guidelines went further than the researchers' recommendations, giving the Local Governments rights to all taxes collected on properties, motor vehicles and liquor permits.

According to Professor Ofoegbu, the opportunity given to the people to organize themselves is perhaps one of the most important aspects of the Local Governments. To show that the new structures were to play an important role, the federal regime voted credits totalling 100 million nairas (\$166 million) to the Local Governments' first year of operation. A large part of this sum will pay the salaries of councillors, set by the regime between 7200 and 4500 nairas.

The military regime had stated that all Local Government councillors had to be chosen before the end of December 1976. Each traditional community then had to elect a ruler, according to its own traditions, before the end of March 1977. In many States some criticized the nomination of a percentage of the councillors by the government, but elections were widely held, and even influential people sometimes lost. According to observers of the Nigerian scene, these two nationwide campaigns for selecting chiefs and electing LG councillors were considered a great success. They are a landmark in the reconciliation of Nigeria with one of its oldest traditions, the chieftaincy, while being the starting point of a completely new system of regional authorities.

Professor Ofoegbu is proud that many recommendations made by his group were implemented in the Guidelines. "One has to admit that it is still not democracy from top to bottom," he says, "but before everybody was only talking about war. Today we are arguing about a constitution and elections. This is already an important progress."

A librarian for more than 30 years, Jean de Chantal has practiced his profession in Canada, Ghana, Mauritius and Mexico. Before becoming the IDRC Librarian, in January 1976, he was associate director for library development, Information Sciences Division, at the Centre's regional office in Dakar, Senegal. This article originally appeared in French in Le CRDI Explore Vol. 6 No. 2.

Development needs libraries

COMMENTARY

Jean de Chantal

Many people who have visited the Third World, especially those returning from a trip to French-speaking Africa, are amazed at the lack of public libraries in the former French colonies. The contrast becomes all the more striking when compared with impressive achievements of their English-speaking neighbours who also gained their independence in the early sixties. The marked difference is obviously not due to climatic or geographic factors. The causes, therefore, must lie elsewhere.

To begin with, there is the legacy of the past. A study published in France in 1968 showed that France herself had not yet attained the level of public library activity that Britain had known in 1908. In 1960, the *Syndicat national des éditeurs* (national publishers' association) found out that 58 percent of French people never read books. This rather uninspiring situation is further illustrated by these equally revealing figures: 4.5 percent of the population of France were at that time members of municipal libraries, as opposed to 20 percent of North Americans and 30 percent of the people in England, Russia and Denmark. Ten books per year per inhabitant were borrowed in Great Britain, 7 in Denmark, 5.4 in the United States and 0.75 in France. Annual library expenditures per inhabitant were 42 cents in Denmark, 30 in the United States, 15 in Canada and 1.5 in France. No wonder the Premier at the time, Georges Pompidou, remarked that France had a great deal of work ahead of her in the area of public libraries.

With such a situation in the mother country, it is hardly surprising that nothing was done in the colonies, so that when they achieved independence they found themselves without any kind of structure, framework or tradition of public libraries.

Their English-speaking neighbours, on the other hand, in the earliest years of independence already had well-equipped archives services in air-conditioned buildings, central libraries whose bookmobiles made regular trips into the bush, adequate legislation providing for public funds in accordance

with the available resources, and even schools of library science; the one in Ibadan, Nigeria opened its doors in 1960, while that of Accra, Ghana was opened in 1962. (*L'Ecole nationale supérieure de bibliothécaires* was established in Paris in 1963.)

How is it that the development of a cultural institution as important as the public library has followed such divergent patterns in France and England? After all, many favourable factors are common to both countries: economic growth, the development of elementary schooling, the drop in illiteracy, and the progress made by democratic ideas. Although I do not wish to dwell on considerations outside the scope of this article, it is still worthwhile to recall a few major factors that shed some light, mainly on the European scene, to be sure, but part of it is reflected on the African territories which were then still waiting in the wings. The success of libraries in Anglo-Saxon countries is partly due to the spirit of association and enterprise, and to administrative decentralization. The English counties, responsible for their own cultural policy, have all been eager to outdo each other in dynamism and inventiveness, whereas in France, the communes were dispossessed of their power and showed little interest in the institutions imposed on them by the central government. Another determining factor lies in the importance attached by English-speaking countries to continuing education as an individual process. In France, education is seen as the exclusive domain of the schools, whose teaching approach is not oriented toward reading and individual work. Finally, in England as in the United States, libraries have symbolized a spirit of collective responsibility on the part of the citizens. They embodied the unity of the society: millionaires like the famous Andrew Carnegie were their patrons, they were frequented by workers and craftsmen, and everyone felt that libraries ranked with the schools and the Church as one of the cornerstones of civilization. In France, on the contrary, the society was divided and the country torn by deep-

rooted religious and political conflicts, so that there could be no collective, relatively disinterested effort toward such a goal. It was not until 1945 that the *Direction des bibliothèques et de la lecture publique* was established in France.

Thus, the newly independent French-speaking African nations were left with little or no tradition of public libraries. They were faced — and are still faced today — with a number of difficulties in setting up their libraries. First of all there is the omnipresent financial problem: libraries are expensive and make no tangible contribution to the economy of a country. Government officials confronted with economic development imperatives tend to think only in terms of immediate returns, and have not always understood the role that can and should be played by well-organized libraries (guaranteed by a strong, securely established library profession) in improving educational conditions, the modernization of teaching methods, and the economic life of the country. This is particularly true in Africa, which must learn to depend less heavily on the outside world, and modify its industrial development strategy by importing ideas rather than products.

The bureaucrats still do not understand that the circulation, safekeeping and redistribution of scientific, industrial and administrative information should be of primary concern to any government, that the librarian plays an indispensable role in this area, and that the creation and development of libraries must be given priority in the national plan for economic and social development. Libraries are at the bottom of the priorities list, and the library profession is suffering tremendously as a result.

Then there is the problem of professional training for the French-speaking librarians of Black Africa. Before the opening in 1967 of the only French-language school of library science for Africans south of the Sahara (there are at least six English-language schools), training was available only in France. Such training was often unsatisfactory, being largely geared to the needs of developed



Young Ghanaians enjoy excellent library facilities, but their neighbours in Francophone Africa are not so lucky.

countries, and in any case the number of places made available to Africans was insufficient, and admission requirements often unrealistic.

The final report of the meeting of experts on national planning for documentation and library services in Africa, held in Kampala in December 1970, concluded "that the training of competent personnel in sufficient numbers and at all levels is a decisive factor in library development. This can be best accomplished by creating schools for librarians in which the necessary human and financial resources are available. Training in other countries has been recognized as a means of providing both instruction which would not otherwise be available and a source of enrichment for locally trained librarians, but participants have found that, on the whole, it is preferable for African librarians to receive their basic training in Africa."

Providing this kind of basic training presents numerous problems, such as that of recruiting local librarians who are able to adapt their training (in most cases received abroad) to the needs of their own countries. The second most difficult problem is to find textbooks adapted to African needs. A few already exist, but they are in English. Since good translations are difficult to come by, trainees generally make do with texts used in France or Belgium.

In February 1974, the *Ecole des Bibliothécaires, Archivistes et Documentalistes* (EBAD) of Dakar organized a seminar (at which the IDRC was represented) on problems common to schools for librarians in Africa, both Anglophone and Francophone. After an exhaustive study of these difficulties, the participants recommended, among other things, "that an information program be established to facilitate the exchange of documentation such as annual reports, development programs, research documents, teaching programs, statistics and lists of professors; that an exchange program for professors and students of the different librarian schools be set up as soon as possible; that Unesco assist in the preparation of a book on the history and development of libraries in Africa, which would include information avail-

able in the various librarian schools in Africa but not yet published."

But what is the present status in the profession in Francophone Africa? For an answer to this important question, I cannot do better than to paraphrase the remarks of an African librarian who has an extensive knowledge of the situation. The role of libraries in these countries is not well established and is therefore far from being fully appreciated. This lack of recognition, this ignorance of the librarian's profession, is painfully evident during a period, not yet over, in which the librarian, considered a keeper — a "guardian" — of books, is not thought to need special training.

Consequently, the job is given to the pretty young niece of a high official for whom it is necessary to find a position involving little or no work, to the incompetent clerk no one quite knows what to do with, or perhaps to the headstrong employee one wishes to subdue by the silent atmosphere of rows of books piled up and forgotten on the shelves. Such attitudes obviously make it impossible to produce a solid group of professionals capable of changing the situation by imparting a sense of direction to library services. To compound the problem, the organization of such services is rarely the responsibility of a single ministry; in most cases the ministry of education takes charge of the school libraries, the ministry of cultural affairs is responsible for the administration of public libraries and yet a third ministry is in charge of the national library, if indeed one exists. In addition, each government ministry operates a library service for its own sphere of activity. The profession therefore suffers from a lack of coordination at the national level in most countries; in others, no policies on library services even exist. Professional librarians find themselves working in a kind of vacuum and face numerous difficulties when attempting to find employment at the administrative level.

As early as 1970, the participants at the Kampala conference mentioned above expressed the hope "that a government organization in charge of library and documentation services be

created, that it be fully representative of all agencies responsible for library services and all government ministries concerned, including those involved in planning and finance, and that it be placed under the jurisdiction of a single ministry having sufficient authority to deal effectively with other government bodies and to sustain a position of political strength."

This desire will eventually be fulfilled especially now that attempts are being made to generate an awareness of the importance of having competent personnel at all levels to assist in the development of effective library services and the establishment of long, medium and short term training programs for library personnel. Some countries have already created library directorates. An effort is also being made to encourage the establishment of professional associations which would constitute a dynamic force capable of uniting the profession, and provide the technical and social framework required for harmonious development. Many countries have opted for a single national association designed to include not only librarians but archivists and documentalists as well.

Finally, efforts are underway to have special status enacted on behalf of librarians that would guarantee the proper recognition of their profession. The IDRC supported these efforts by sponsoring a special conference, held in Dakar in early June of this year, which brought together professionals and senior government officials to discuss the possibility of creating a statute for librarians and documentalists in Francophone Africa. The outcome was an agreement by the participants to recommend to their governments that steps should be taken to recognize and regulate the profession.

If these suggestions are implemented, it will no longer be a case of deploring the situation of readers without libraries but rather of feeling a proud sense of achievement because the people of Francophone Africa will finally be able to enjoy libraries in their own communities. □

There's gold in that garbage

Science column by Alexander Dorozynski

In theory, a society that has reached demographic stability and a satisfactory standard of living, could continue under its own impetus to produce consumer goods without having to rely on any additional supply of raw materials. It would suffice that, as these products were consumed or worn out, their constituent elements be recycled. This implies, of course, sufficient energy resources to keep this perpetual recycling motion going.

In practice such perfect conservation is impossible, because the extraction of every bit of raw material from manufactured goods that are no longer needed is too costly. But the opposite — that is, the total abandonment of waste in municipal rubbish heaps (a 2,000 year-old Roman invention, by the way) — is also unthinkable. Some degree of recycling, has become a necessity in a world where the finite nature of our resources is becoming increasingly evident. As a result, the past few years have witnessed a spectacular expansion of a whole new industry: the recycling industry. Faced with a shortage of energy and raw materials, we are discovering wealth in humanity's garbage cans, and the many ways of utilizing this wealth. A few examples:

- American researchers have shown that a ton of household waste can yield 70 kilos of metal, 60 kilos of glass, and 80 kilos of combustible matter. Pyrolysis (decomposition by heat) can distill volatile matter, producing methane to ensure the thermal autonomy of the system. More than 150 litres of synthetic fuel oil can be produced from this ton of waste.

- A ton of recycled paper fibre saves a ton of wood — the equivalent of about one dozen trees, or the product of a quarter of a hectare or more of forest. This throws a new light on the problem of shortage of paper.

- In several countries, a third or more of the total production of copper, lead, aluminum, steel, zinc, comes from the recycling of products containing these metals.

- Elsewhere, it has been shown that used tires, instead of invading the landscape, can be submerged over unproductive sandy bottoms to serve as shelter for fish, that gather quickly to settle in this new habitat. Or else worn out tires may be used to make sandals, to stabilize river banks, or to

produce rubber powder.

- In India, farm refuse is increasingly utilized for the production of methane gas, a process which does not detract from its traditional role as fertilizer, but in fact improves it.

- In Egypt, several research projects have underlined the potential of recycling waste and various agricultural by-products to increase animal production (see article on p. 6).

Dozens of other examples could be given, including that of an experimental home, complete with modern comforts, that was built, cellar to roof, from recycled waste materials.

In the industrial West as well as in the developing world, the garbage and recycling business will know rapid growth in the years to come. And it is in the developing countries, where the Roman invention — hygienic perhaps, but polluting, wasteful and unsightly — has not been adapted yet, that time and money can be gained by designing, from the start, systems that are more rational and better adapted to existing conditions.

Leo Tolstoi, the author, who was an ecologist long before the word was known as it is today, used to say that garbage "is what nobody wants at the place where it is." Moved to where it should be, this by-product of civilization becomes a source of capital we won't be able to do without. It is true that recycling may not be the most prestigious of industries, but that does not detract from its importance, an importance that will continue to increase in direct proportion to nearly all of a country's production.

It is, as they say in big business circles, a growth industry.

Recycling waste sugar cane for animal feed in Mexico.



Photo: Neill McKee

Viewpoint

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada, K1G 3H9.

The juxtaposition of the articles "Fishing for Development" and "International Centres Play a Vital Role" (*Reports*, Vol. 6 No. 2), may be fortuitous, but together they rekindle a concept that C.F. Hickling attempted to implement at the Tropical Fish Culture Research Institute at Malacca, Malaya, about 20 years ago.

I hope we have learned through the experience of the Consultative Group on International Agricultural Research enough about the formation and management of such efforts to reinstitute the Malacca idea (more appropriately sited) so that an International Centre for Aquacultural Research, correlative with the agricultural research institutes, can again be activated. The institute should be located somewhere within a girdle of the lower latitudes where aquatic bio-productivity is high and therefore aquaculture, both coastal and inland, has a greater probability of success as a food and wealth generating endeavour.

Harold H. Webber
President
Grotton BioIndustries Development Company
Grotton, Mass.
USA

I was most interested in J.Y. Peng's "Village midwives deliver" (*Reports* Vol. 6 No. 2). I am sure as a mere, non-medical male that there is a great deal to be done in the direction of working together with traditional midwives. They are often both powerful and intelligent, if conservative members of the community.

At a recent seminar in Nigeria we were given examples of two programs. In one the midwives were becoming fully involved, and to their questioning of the program in bringing in youngish school-leavers to work with them, the answer "well, even you had to begin sometime" was being accepted. In the other program we were told that local midwives were not interested or cooperative. This seemed to me to say more about the medical personnel involved than about the midwives, and pointed to the need for discussion and training in cooperative, "non-directive" approach for the increasing number of "fully" trained medical personnel seeping into the rural areas of the Third World.

G. Brian Stapleton
Woodford Green
England

Out here in the Third World we are always fascinated by new discoveries made in the industrialized world, and the West's recent discovery of "traditional medicine" is no exception. The article you published (*Reports* Vol. 6 No. 2 p. 6) on traditional medicine in Africa is a sign of the interest now being taken by research and aid institutions, including the WHO, in a system of medicine that predates Vasco Dagama's historic voyage to the east.

Traditional medicine almost went into hiding during colonial times because, like so many other national characteristics and institutions of colonized countries, it could not survive against an imported system that was given both official patronage and recognition. The new trend, to which the IDRC has I believe contributed, should help to correct that situation.

There are two factors that need to be kept in mind, however, in any assessment of traditional medicine. The first is that this branch of medicine is today beset by a large number of quacks, who flourish because registration and control of practitioners are loose and inadequate, if they exist at all. If such practitioners are allowed to carry on regardless, they will continue to harm both the system of medicine they pervert, and their patients. The second is that in many Asian countries traditional medical cures go hand in hand with religious practices and discipline, such as fasting, abstinence and so on.

To seek laboratory validation of traditional cures without taking this aspect of the medical system into account is to take a dangerously lopsided approach.

Naomal Ratnayake
Panadura
Sri Lanka

BRIEFS

AWARDS HELP YOUNG SCIENTISTS

Several years ago a group of senior Latin American scientists, concerned about the lack of support and opportunity for research in human reproduction biology in the region, held a series of meetings to attempt to find a solution to the problem. The outcome was PLAMIRH, the Latin American Human Reproduction Research Program — an awards program designed specifically to help young scientists become established in a research career.

In many respects the program exceeded the expectations of its creators during the two-year pilot phase from 1974 to 1976, and is now in a four-year second phase with the support of grants from the IDRC and the Ford Foundation. In three years PLAMIRH has received 165 research proposals and has made 84 awards (the maximum grant is \$15,000), 60 percent of them to researchers under the age of 35. The results of all this research will be widely disseminated through the program: already some 50 titles have been published or are in preparation.

The program is run entirely by Latin Americans. Its headquarters are at the Regional Population Centre in Bogota, Colombia (a non-profit organization dedicated to population research and education), and it is managed by an unpaid board of directors drawn from the region. Project proposals are evaluated by a Scientific Committee of three or more Latin American scientists.

During its second phase PLAMIRH will place more emphasis on support for applied rather than basic research, and will attempt to obtain greater involvement from the least developed countries in the region.

GEOSCIENTIST GOVERNOR WINS AWARD

The French Canadian Association for the Advancement of Science has awarded its most prestigious prize for achievement in the fields of applied sciences and engineering to Professor Roger A. Blais, Vice-Chairman of the IDRC's Board of Governors and Chairman of the Board's Executive Committee.

A geological engineer by profes-

sion, Prof. Blais is Dean of Research at the Ecole Polytechnique in Montreal. Author of numerous scientific papers, he has acquired an international reputation through his efforts to promote the advancement of earth sciences both at home and abroad. He is international vice-president of an association of geoscientists which he and a few colleagues founded three years ago, for the specific purpose of promoting scientific development in the Third World. Today the association has some 900 members in 85 countries.

Prof. Blais receives the Archambault Medal, awarded annually in memory of the founder of the Ecole Polytechnique, and becomes the first "staffer" in the school's 104-year history to be awarded this distinction.

DEVELOPMENT INFORMATION SYSTEM

Development projects throughout the world annually generate some 100,000 reports. Most of these unfortunately remain hidden in file cabinets or are discarded once the project is completed.

Concerned about this wastage of valuable information, six international organizations have proposed the establishment of DEVSIS, an international development information system that would allow all countries to benefit from the experience of others in such varied fields as education, agriculture, engineering, housing construction, health care and so forth.

A group of experts, directed by John Woolston, director of IDRC's Information Sciences Division, devoted several months to the design of the system. Membership will be open to all countries and the cost minimal: that of contributing in written or computer-readable form the results of their development experiences and of paying the material costs of reprints or microfilm copies they request.

National or regional centres will feed information into a central unit. The computer stored information can then be retrieved instantly — by subject, author or geographical area. Initially documents will be available in English, French, Spanish and, perhaps, Arabic. In addition, a user will be able to request constant monitoring of developments in specific fields.

A printed, periodical index of all information contributed by participants will be produced. This information will also be available on magnetic tapes, in a format

corresponding to internationally agreed standards.

DEVSIS will become fully operational once enough countries have committed themselves to participating. Discussions are also underway on the possibility of setting up the central unit of this information bank under the aegis of the United Nations, one of the project's sponsors.

NEW HEAD FOR FOOD RESEARCH INSTITUTE

Mr John W. Mellor, former Chief Economist at USAID, has been appointed director of the International Food Policy Research Institute (IFPRI). An agricultural economist, Mr Mellor was a Professor at Cornell University where he was also Director of the Program on Comparative Economic Development.

The author of numerous articles and books dealing with various aspects of development strategy generally and the growth of agriculture specifically, Mr Mellor directed research projects in a number of developing countries. He has also been a consultant to the International Bank for Reconstruction and Development, the FAO and the Ford and Rockefeller Foundations.

Jointly funded by the IDRC, the Ford and Rockefeller Foundations, IFPRI was established in 1975 to conduct research on policy problems related to food needs in developing countries. Based in Washington, it identifies alternative plans for action that are primarily directed at governments and international organizations to increase food supplies and improve nutrition through improvements in production, trade and distribution.

Mr Mellor replaces Mr Dale E. Hathaway who served as IFPRI's director since the institute was established.

A LONG AND VARIED CAREER

Dr J. King Gordon, IDRC's Senior Advisor, Canadian University Relations, was appointed Member of the Order of Canada in July of this year. Appointments to the Order of Canada, created in 1967 to recognize outstanding achievements and merit in all major fields of endeavour, are made by the Govern-

ment General with the approval of The Queen who is Sovereign of the Order.

Born in Winnipeg, Manitoba, Dr Gordon has had a long, distinguished and varied career. During the 1920s and 1930s, he served in the Home Mission Field for the United Church in British Columbia's lumber camps and mill towns, was professor of theology, then travelling Secretary of the Fellowship for a Christian Social Order. After working as a journalist and editor, he became United Nations Representative for the Canadian Broadcasting Corporation.

From 1950 to 1961, Dr Gordon held various positions in the United Nations Secretariat, in New York, Korea, Egypt and the Congo. Professor of International Relations at the University of Alberta from 1962 to 1967, he then moved to the University of Ottawa where he became Professor of International Relations and co-founder, assistant-director and research associate at the Institute of International Cooperation. Among other posts, he has been Chairman of the National Executive of the Canadian University Service Overseas, member of the Planning Council of the International Ocean Institute and President of the United Nations Association in Canada. In 1977 he became a member of the North American Council of the International Peace Foundation. Dr Gordon is also the author of several books on Canadian and international affairs.

THE FUEL OF THE FUTURE

Sunlight is the fuel of the future, according to Denis Hayes, a senior researcher with the Washington-based Worldwatch Institute. In a new book *Rays of Hope* (published by W.W. Norton, New York) Hayes predicts that world oil production will begin to decline within 20 years, and opts for solar energy as the main choice to fuel a post-petroleum world.

The nuclear dream, says Hayes, is fading fast — the risks are simply too great. Coal, the other major option, is also environmentally hazardous for large-scale use. Within two decades society must be well on the way to reliance on sunlight, falling water, wind and green plants, to minimize the inevitable social and economic disruption caused by the end of the oil era, he warns,

adding that the timetable for the solar transition is already far behind schedule.

The 240-page book documents the potential for that transition (already 20 percent of the global energy supply comes from the sun). It also examines other sources, such as the wind (there are still 150,000 working windmills in the US alone), falling water, organic sources, waste matter, and energy conservation. "A solar society," concludes Hayes, "would be thrifty, decentralized, simple and safe."

BOOK SHOW SURPRISES SINGAPORE

The IDRC's Asian Regional Office (ASRO) was among the exhibitors recently at the ninth Singapore Festival of Books and Book Fair.

This was the first time ASRO had participated in the annual event, and interest in the Centre's colourful display of scientific, technical and general publications was considerable. ASRO librarian Maria Ng, who was in charge of the 10-day exhibit, reports that some 6,200 visitors browsed at the bookshelves, among them Mr Lee Khoo Choy, Senior Minister of State for Foreign Affairs (seen at left in photo with ASRO director Jingjai Hanchanlash).



ASRO's support staff worked in shifts to keep the book stand manned 10 hours a day. The results were rewarding though: some 1,400 books distributed, in addition to numerous copies of *IDRC Reports*. Maria Ng also reports that it was a good exercise in acquainting the Singapore public (and foreign visitors) with the work of the IDRC in Asia, and many expressed surprise at the large range of publications.

Although the Fair is now over, the exhibit continues to serve a useful purpose. It has been reassembled in the foyer at ASRO to serve visitors to the office.

The scientist as poet

Alexander Dorozynski

Not many people could find poetry in that most prosaic of instruments, the computer. But Daniel Hillel does. "A poet gazing through his window may perceive the grass field stretching outside as a realm of supreme serenity and quietude", writes Dr Hillel, a soil scientist with the University of Virginia in Charlottesville. "But to the environmental scientist, it is a system of incessant flux, where matter and energy are transformed and transported to and fro in a series of numerous concurrent processes involving physical, chemical, and biological changes."

One way to bridge the vast gap between poet and scientist says Hillel is through the modern computer, which is capable of processing simultaneously the many constantly interacting variables and thus can help us to understand the complex interrelationships between soil, water and plant.

For many years, soil science relied more on experimentation than theory. "We did not know how to reconcile the results. Our approach was empirical, and very often we did not consider the interacting, dynamic factors that came into play. Now, the technique of computer simulation can help us pre-search the best answer before undertaking costly experiments."

Many soil scientists, he points out, have not been trained in computer science, and if they haven't caught up with it, they may well become "obsolete". Dr Hillel himself (after studying at the University of Georgia, Rutgers, the Hebrew University in Jerusalem, and completing postgraduate work at the University of California at Berkeley) came to the field in the 1950s, when computer science was still a fledgling. Hence, he says, he has had to make an effort to retrain himself in the new art — or suffer the likely consequence of prematurely becoming an administrator!

Working in the United States, Japan, Israel, and Belgium, he acquired the techniques necessary for the elaboration and utilization of models simulating soil-plant-water interactions.

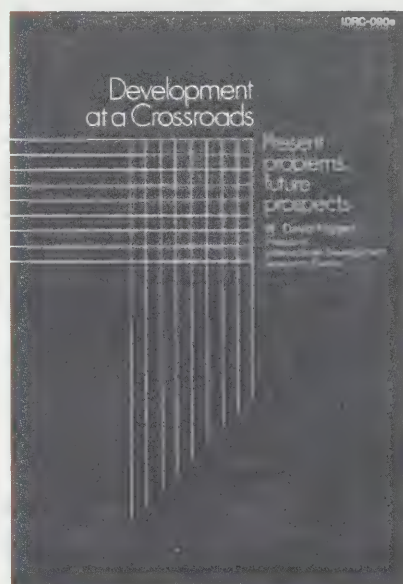
In the past two years, Dr Hillel, with

the help of an IDRC fellowship, has committed to paper some of the computer models he has developed or been involved with. His book (*Computer Simulation of Soil-Water Dynamics — A Compendium of Recent Work*, IDRC-082e) is addressed to problem-oriented research workers. Its purpose is to supplement the usual empirical approach to research, by adding a theoretical dimension that may be essential to reaching "the most crucial decision in any research project" — that is, the decision of what to research. Such models can help identify leads before a project is actually undertaken, and they can also be used to evaluate the results of the research once it is underway or completed.

The book assumes a basic working knowledge of calculus and at least some familiarity with computer programming and, from then on, leads the reader along a path to better understanding of more complex and complete models. A model, however, is by definition a simplification. It cannot account for all the processes at work, and certainly not for processes we may still be unaware of. Dr Hillel points out that he does not wish to convince the reader of the lasting validity of the models he presents, but rather to challenge him to do better on his own. "In science, and particularly in modeling, no "last word" (even if it is, for a fleeting moment, the "latest word") can ever become the "final word". But simulation is a good point of departure for theorists and experimentalists to begin journeying together."

Dr Hillel, who received his own basic training "in the primitive prehistoric dark ages before computers appeared on the scene and became ubiquitous and inescapable", demonstrates the value of learning the "new art".

"And what a pleasure", he adds, "to be able to bend this powerful machine to your will and make it do your bidding, as, stage-by-stage, it calculates how energy and mass interact in making plants grow to fruition in a simulated field, combining the exactitude of science with the beauty of poetry." □



Development at a Crossroads: Present problems, future prospects, by W. David Hopper. Published July 1977, 18 pages, IDRC-090e.

This monograph is based on a lecture delivered by the IDRC President in Tokyo earlier this year at the invitation of the Japanese Ministry of Foreign Affairs. It presents an historical overview of development assistance efforts, examines some of the factors contributing to present problems, and concludes on an optimistic note, with Dr Hopper stating his belief that "the joint actions of rich and poor can and will be focused on harmonizing economic possibilities with need."

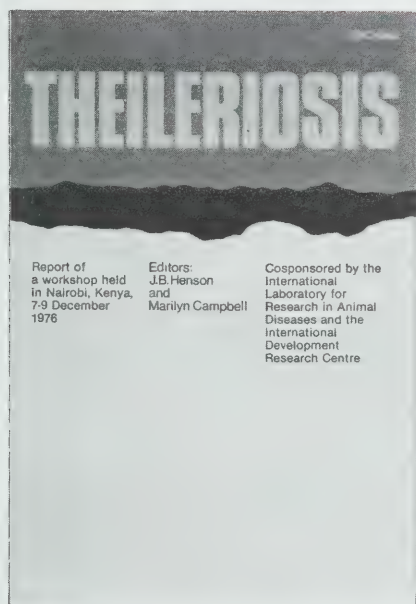
Trees for People, by Clyde Sanger, Gilles Lessard and Gunnar Poulsen. Published September 1977, 52 pages, IDRC-094e.

This monograph is the first in a planned series describing in detail the research supported by the Agriculture, Food and Nutrition Sciences Division of the IDRC, and deals with the forestry research program. It describes many projects in fields such as plantation research, agroforestry and tropical timber utilization, as well as a section on the proposed International Council for Research in Agroforestry.

Social Change and Internal Migration: A review of research findings from Africa, Asia and Latin America, by Alan Simmons, Sergio Diaz-Briquets, and Ap-rodicio A. Laquian. Published July 1977, 128 pages, IDRC-TS6e.

This report by the Centre's Migration Review Task Force focusses on development policy issues and related research implications with respect to migration and population distribution. While each region is reviewed separately, the report is structured to enable easy cross-reference to specific topics. The report also contains an extensive bibliography.

New publications

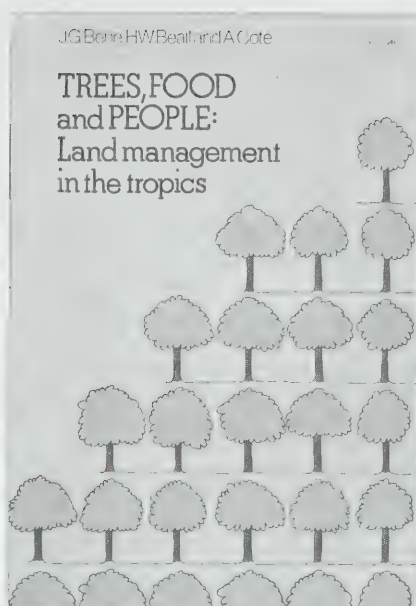


Theileriosis: Report of a workshop held in Nairobi, Kenya, 7-9 December 1976, J.B. Henson and Marilyn Campbell, editors. Published August 1977, 112 pages, IDRC-086e.

Theileriosis is a disease, fatal in cattle and other ruminants, that severely limits cattle production in many countries of Africa and the Middle East. This workshop was cosponsored by the International Laboratory for Research on Animal Diseases, Kenya, and the IDRC in order to focus attention on the promising research work that has already been done, and to bring about a closer degree of international cooperation in research on theileriosis. Contains papers presented at the meeting, recommendations of special committees, and a list of participants.

Trees, Food and People: Land management in the tropics, by J.G. Bene, H.W. Beall and A. Coté. Published August 1977, 52 pages, IDRC-084e.

This monograph is the outcome of an IDRC project to identify research priorities in the field of tropical forestry. Basing their report on the contributions of a global network of consultant experts, the authors begin by warning that today's forests could be transformed into an "unproductive wasteland" within 30



years. The report explores the immense and varied potential of trees in the tropics and concludes with recommendations for an international plan of action to protect and properly exploit the forest through integrated land use systems. Illustrated, with tables and references.

Project Impact — an experiment in mass primary education, by Clyde Sanger. Published August 1977, 56 pages, IDRC-088e.

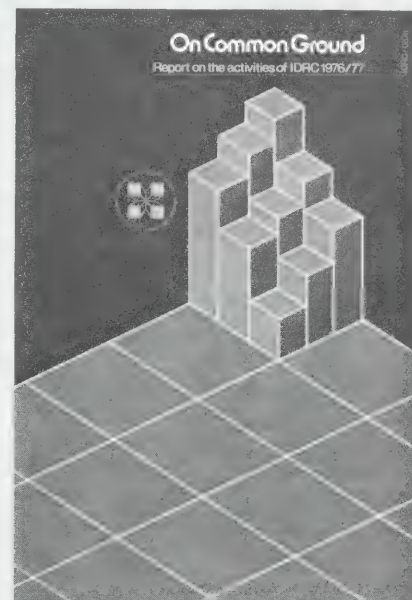
Project Impact is a unique attempt to make primary education available to more children at less cost, by using specially prepared teaching "modules", peer group teaching, and changing the teacher's role to that of "instructional supervisor". Clyde Sanger visited many of the village schools in Indonesia and the Philippines that are taking part in the project, and spoke to the planners, organizers and the pupils to prepare this progress report. The booklet is extensively illustrated with colour photos, and includes sections on the problem, the setting, the components, and an assessment of results so far.

Low-cost Rural Health Care and Health Manpower Training — an annotated bibliography with special emphasis on developing countries, Volume 3, by Frances M. Delaney. Published August 1977, 187 pages, IDRC-093e.

This is the third in a series of bibliographies concerned with the improvement of health services, especially in the rural areas of developing countries. This volume includes information about the planning, financing and organization of low-cost health care systems; their relationships with other community organizations and services, the impact of health services on social and economic indices, and the types and functions of different health care personnel. Contains 700 abstracts, separately indexed by subject, by author and by geographical location.

On Common Ground — IDRC Review 1976/1977, by Bob Stanley. Published September 1977, 32 pages, IDRC-087e.

A non-technical review of the work of the IDRC over the past year in the perspective of some of the major current concerns in the field of international development research — land and people, water and health, farmers and food. Contains first-hand reports and photos of Centre-supported projects, a breakdown of project funding, and a list of new publications. Also available in French (IDRC-087f) and in Spanish (IDRC-087s).



Applied Operational Research, Alexandre Dorozynski, editor. Published September 1977, 27 pages, IDRC-081e.

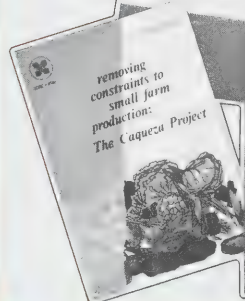
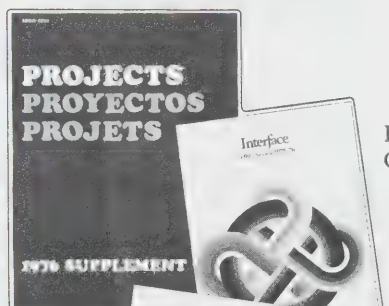
Originally published in French, this is a report of a seminar-workshop on applied research in public health, held in Yaounde, Cameroon, in December 1976. The report attempts to show that the scientific approach to planning a research project is not necessarily either complex or costly. Participants in the multi-disciplinary workshop actually drew up two detailed research proposals that serve as a demonstration of the use of logical problem-solving techniques in project planning.

For details of how to obtain copies of these and other IDRC publications, see advertisement on the back cover of this issue.

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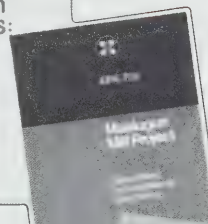
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The IDRC



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Reports

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Cover photo by Neill McKee: Iranian boy atop the ruins of Persepolis, ancient capital of Persia — the good times may soon return (see article on facing page).

- 3 **Change comes again to the fertile crescent**
Alexander Dorozynski reports on new developments in the land where agriculture began 10,000 years ago.
- 7 **Ponds reduce wastes**
Five countries join forces to cut pollution and increase food supplies — report by Rowan Shirkie.
- 9 **'Try it, and tell me what you think'**
How to get farmers to adopt new plant varieties — Jean-Marc Fleury reports from West Africa.
- 10 **Changes in senior management at IDRC.**
- 11 **Science and technology serving development**
Francisco Sagasti reports from Bogota on one of the largest projects of its kind ever undertaken.
- 13 **Energy: a fundamental adjustment is needed**
The industrialized countries discuss their responsibilities in the energy field — report by Michelle Hibler.
- 15 **Briefs**
People, projects, events.
- 16 **Third world needs agricultural development, not food**
Canadian scientists meet to discuss Canada's role in world agriculture. Report by David Spurgeon.
- 18 **'Peasants in the cities' play a useful role**
A look at the role of street traders in six Asian cities, with Y.M. Yeung.
- 20 **Commentary**
Is there hope for mankind? Scientist Daniel Hillel presents his case for conditional optimism.
- 23 **New publications**

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Change comes again to the fertile crescent

Alexander Dorozynski



Photos: A. Dorozynski

Traditional farming near Aleppo: methods have changed very little over the centuries — until now.

The fertile crescent is that region, shaped like the moon in its first quarter, that curves from the Nile to the Tigris, encompassing the ancient lands of Palestine, Phoenicia, Babylonia, and Assyria, encroaching on Egypt to the south, the Taurus mountains of Anatolia and the Zagros in Persia to the north, and reaching east to the Persian gulf where flowered one of the most ancient known civilizations, that of Sumer.

It was in the fertile crescent at the end of the last ice age some 10,000 years ago, that agriculture came to being and transformed man's life from that of a roving nomad to settled villager.

Plants that are the ancestors of many of our major crops appeared there. Wild wheat, then one of the many wild grasses in the region, gave rise after countless haphazard crossings to fertile hybrids such as Emmer wheat, then to crosses of Emmer with other grasses, and eventually to a true "bread wheat" with a full head of seed. Wild lentils, beans and other legumes, first gathered by men, became domesticated. Fruit trees were planted close to human settlements.

It was there also that man wrought the tools of a new technology that is still basic to agriculture in much of the world today: the first flint sickle, set in a horn or a piece of bone, the olive mortar and the wine press, the baker's oven, then the plow, "lever to feed the earth", the wheel, and the pulley to draw water.

The names of the ancient cities in the fertile crescent ring out the beginning of the known history of mankind: Memphis, Jericho, Babylon, Suza, Assur, Nineveh and many others, where not only agriculture, but pottery and music, graphic arts and writing, were born, and geometry came to regulate land ownership, and arithmetic, perhaps to calculate taxation.

One of the most ancient, continuously inhabited cities of this region is Aleppo, already known by this name before it was conquered by the Hittites, before Assyria burst from Mesopotamia, the region between the Tigris and the Euphrates, to become one of the greatest empires in mankind's history, boasting a list of 116 successive kings who sat on Assur's throne.

Aleppo today is a lively commercial and manufacturing city, and it has become this year the symbolic centre of yet another major event taking place in the region: the transition from traditional agriculture which for thousands of years had fed a human population of a few million, to modern agriculture that must, today and in the years to come, feed hundreds of millions.

New people have come to Aleppo, long a crossroads for caravans between the Mediterranean and Mesopotamia. They have come from many parts of the world — or is it, one may wonder, from other planets? They are called the "wheat and barley people", "pulse people", a "weed man" and an "insect man", the "rotation people", and a "medic man" (who, incidentally, has nothing to do with medicine).

The newcomers are members of the newly established International Centre for Agricultural Research in the Dry Areas (ICARDA), whose responsibility extends far beyond the ancient fertile crescent, to a region stretching from Pakistan to the east and Morocco to the west, a region that contains today some 20 countries, inhabited by more than 250 million people.

ICARDA's mission is to augment the agricultural productivity of some 100 million square kilometres of arable land, most of it characterized by limited annual rainfall (300 to 800 mm) concen-

trated mainly during the winter months, by dry, hot summers, and by low agricultural productivity in the face of an increasing population.

Agricultural productivity must increase rapidly, as in many parts of this region food shortages are becoming a problem and there is increasing reliance on imports at the cost of hard-earned foreign currency. The situation threatens to worsen as the population keeps growing at such a rate that it is expected to double in 40 years or so.

What can be done, that can be done within a relatively short time span? Many things, but they require the concerted, intensive effort of members of a team whose business is agricultural research.

Consider an ancient custom, stemming no doubt from the observation that the land is not rich enough, and that it does not receive enough rain, for it to support a crop of cereal, such as wheat or barley, year after year. This has led to the fallow system, whereby cereals are grown one year, nothing is planted the following year, then cereals again and so on. It is as if half of the land were permanently abandoned. Although precise figures are difficult to come by, one of ICARDA's researchers, B.H. Somaroo, a Canadian, who explores the possibility of introducing crop rotation into the farming system, estimates that as much as 40 million hectares of land could be fallowed in one year in the region!

Legumes are a prime candidate for such a rotation system because they enrich the soil. Ancient Greek and Roman authors referred to the benefits to the soil that result from growing legumes, and we now know that this benefit is provided in the form of nitrogen fixed by bacteria living in nodules on a legume's root, and thus made available to the plant.

Establishing such a rotation system may appear to be simple enough: plant wheat this year, forage legume the next, and feed your sheep on these legumes. But it is not as simple as that. Legumes must be selected to suit the soil, to resist local insects, to be beneficial to the following year's cereal crop, and not to draw too much moisture from the soil, lest it be left parched for next year's all-important wheat crop. Farm size, agricultural practices, interest (or lack of it) in livestock, economic and social constraints, also come into the picture.

One particularly promising approach is explored by the "medic man", John Doolette, an Australian scientist who has had a long acquaintance with a small bush-like plant with yellow flowers, the medic (or *Medicago*). The medic, that can be seen growing freely on roadsides around the Mediterranean, has an interesting past. A century or so ago, some medic seeds were accidentally carried aboard ships sailing from Europe or Africa to Australia, and medic started growing there, particularly in the south, where conditions are similar to those in its native land.

Legume research is part of the ICARDA plan to maximize agricultural output in the region.



Australian farmers, many of whom also left their cereal fields fallow, noticed that medic was a favourite food for sheep, who thrived on it; some of these farmers started planting medic on a rotation basis. Soon they realized that if they planted medic after the wheat harvest, not only could sheep graze on land that previously had been left fallow and produced little grass, but the wheat harvest improved because land had received free nitrogen fertilizer from the medic.

In addition, it turned out that provident nature had endowed medic with one particular characteristic that would be difficult to invent if you wanted to. The plant has a very hard seed coat. After the seeds are plowed under the earth, most of them do not germinate on the following year, when cereals are planted. It is only on the second year that most medic seeds crack and germinate. So that in theory (and this has been a fact in Australia) medic seeds need only be planted once: they continue giving crop after crop every other year. In between, wheat or barley is grown.

John Doolette had befriended medic in his own country, and then experimented with it for six years in Tunisia under the sponsorship of CIMMYT (the International Centre for Improvement of Maize and Wheat, in Mexico) and the Ford Foundation. He hopes to move fast with his program, adopting what he calls "the best bet approach".

"Nitrogen fixing bacteria native to the Middle East and North Africa appear to be adequate," he says. "In rotation trials in North Africa wheat following medic produced without fertilizers as much as wheat fertilized with 60 kgs of nitrogen

per hectare following a fallow year. Medic also competes with weeds. This is an important point since a survey has shown that weeds lower wheat production by about 20 percent. So, the best bet is to try right here the system developed in Australia, tested in and adapted to Tunisia. Or else, we would have to spend another 10 to 20 years to go through all the preliminary work."

The "best bet" approach, while it saves time, nevertheless requires the screening of several lines of medic and of strains of nitrogen fixing bacteria against different soils in different climatic conditions. This rotation system, believes Mr Doolette, is particularly suitable to regions receiving 350 to 500 mm of rain, where cereal production is marginal. "I believe that in many regions where this rotation can be introduced, cereal yields can be improved, and animal production can at least be doubled," he says.

Food legumes, or "pulses", are another important area of research. It is true that in terms of world production, food legumes are far behind cereals, but they should not, says Geoffrey Hawtin, a British researcher who is ICARDA's "pulse man", be considered only a poor man's food (as they were in ancient Greece, when the saying "he doesn't like lentils any more" was the equivalent of "he's risen from rags to riches".) In fact food legumes represent an important source of cash income, and they often turn up on the "luxury market", whether used raw as vegetables or snacks, or transformed into traditional delicacies such as *hommos*, a paste made with chickpeas and sesame.

ICARDA's legume research program will focus on three major "pulses" in the region: broadbeans, lentils, and chickpeas.

The total annual world production of broadbeans is around 5 or 6 million tons, and much of this is grown in the Middle East. ICARDA is off to a good start, as it has "inherited" a germplasm collection of some 1,200 lines of broadbeans from the Arid Lands Agricultural Development Program (ALAD — the forerunner of ICARDA, jointly funded by the Ford Foundation and the IDRC). Most of the results of ALAD's research, and a number of ALAD's scientists, have been incorporated into the larger ICARDA program. From such a collection (which will still grow, particularly if China, an important broadbean producer, contributes to it) a huge number of crosses can be made, for the painstaking selection of qualities best suited to local needs.

There is another, intriguing, aspect to broadbean research. Broadbeans were grown as far back as Pharaonic times, but were regarded as unworthy food, perhaps because they were (and still are) associated with a sometimes lethal disease, favism. Two specific proteins in the bean have been associated with this disease, and it may be possible, through selective crossbreeding, to screen these

proteins out, eliminating a major drawback of this protein-rich food.

Lentils (world production 1 million tons) have a well-substantiated history as one of the first pulses, perhaps the first, to have been domesticated by man. (The earliest lentils unearthed at Mureybit in northern Syria have been dated to 7500-8000 BC — the beginning of agriculture, and there are references to lentils being cultivated in the hanging gardens of Babylon).

Whereas the far-flung ancestor of the broadbean remains anonymous, the paternity for lentils has been attributed to *lens orientalis*, of which wild specimens have been found. This finding has more than academic interest, as *lens orientalis* can easily be crossed with *lens culinaris*, the domesticated species (both have the same number of chromosomes). This could lead to varieties resistant to drought and diseases, perhaps even to early maturing varieties that could be planted in the spring after the winter rainfed harvest to thrive on residual moisture in the soil.

The chickpea was known in ancient Egypt under the name "hrw-bik", meaning falcon face, in reference to the shape of the seed; and in ancient Greece under that of "erebinthos", which also means testes (hence the association of the chickpea with fertility). There are two major groups of chickpeas, the Middle Eastern "kabuli" (presumably named after Kabul) with a large, light-coloured seed, and the smaller, usually darker Indian "desi" (meaning "local" in Hindi). ICARDA's research will concentrate almost exclusively on the kabuli, the only traditionally acceptable chickpea in the region, perhaps because of its looks, perhaps because it is particularly suitable for the making of *hommos*.

Recently a new species of wild chickpeas (*Cicer reticulatum*) was discovered in southern Turkey, and it is now believed to be the true progenitor of the cultivated species. It crosses readily with the cultivated species. Research is also underway to improve harvesting methods for these food legumes, that are becoming increasingly expensive as labour costs go up. "Already," says Geoffrey Hawtin, "we have a beautiful, tall chickpea coming along for mechanized harvesting".

While these "pulses" are important sources of protein-rich food and income in ICARDA's bailiwick, cereals, of course, remain the principal food crop, and the cereal improvement program, under the direction of Indian wheat breeder J.P. Shrivastava, represents the major research thrust.

Wheat and barley are sown on nearly 40 percent of the region's rainfed arable land. Research on wheat is carried out in cooperation with CIMMYT, well known for its contribution to developing the new, high-yielding varieties of wheat that have played such an important role in the "green revolution", as well as with other regional and national organiza-

Training in modern agricultural techniques also forms an essential part of ICARDA's work.



tions. High-yielding, drought-resistant lines, with good protein content and superior breadmaking qualities are being developed and tested on the 1,000 hectare Aleppo site donated by the Syrian government, as well as in nurseries throughout the region. Wheat genotypes are also being studied for salty soils, for resistance to local and regional diseases and insects. Hundreds of crosses are being made, both from locally available germplasm and with seeds received from CIMMYT in Mexico and from breeders and research centres in Australia, North America and Europe.

Of particular importance to the area is barley: in many cases, it can be grown where the growing season is too short or the rainfall inadequate for wheat and other cereals.

Barley has excellent nutritive value, comparable to that of wheat, and it performs well in harsh, dry climates, but it has been largely neglected as human food because it contains little gluten, the elastic protein that gives bread its "bouncy" consistency. Wheat, with its higher gluten content, has thus become the traditional bread-making cereal in most parts of the world and also has benefited from most of the research devoted to cereals.

Barley, however, will receive special attention because its nutritive value can further be improved, notably by increasing its lysine content. Lysine, an amino acid, is essential to human nutrition but is absent from, or in short supply in, most food grain.

In April ICARDA co-sponsored a meeting in Amman, Jordan, of some 120 agricultural scientists to discuss ways of improving yields of barley. Yield varia-

tions reported from one region to another give an indication of the potential for improvement: they are as low as 400 kilograms per hectare in the dry areas of South Yemen, 700 in Jordan, 1,500 in Saudi Arabia, and as high as 3,000 under experimental irrigation in Egypt. The importance of barley research in the region has been underlined by the fact that the Consultative Group on International Agricultural Research (CGIAR), a consortium of donors that supports ICARDA has named it the world centre for barley, lentils and broadbeans.

Cereal research is moving along at a fast clip: over 1,000 crosses made by ICARDA staff have been grown mainly in a major nursery in Egypt, advanced a generation by summer planting in Kenya, and harvested in time for transfer to the Aleppo station before the winter rains.

Some 700 sets of cereal germplasm have also been distributed to regional nurseries, and their performance was reviewed in collaboration with national program scientists. The study of the superior genotypes will continue on the basis of these observations. In the meanwhile an entomologist, Dr Ali El-Ali, professor at the Faculty of Agriculture of the University of Aleppo, is setting up ICARDA's entomology laboratory, where the region's major insect pests, that may cause the loss of as much as a third of a crop in some areas will be studied.

Last but not least is the important, and sometimes sensitive aspect, of the evaluation of the needs of the farmers, and the adaptability of new systems to these needs. There may be a risk that new technologies disturb established tradi-

tions too brusquely, exacerbate income inequalities, accelerate land erosion and create localized unemployment and excessive dependence on imports of seeds, machinery, fuel, and fertilizers.

These aspects must be carefully examined, and as part of the initial "farming systems program" ICARDA has contracted a multidisciplinary team (four people from the Overseas Development Group of Britain's University of East Anglia, working with Syrian research assistants) to carry out a survey of the rural economy of Aleppo Province and to develop an applied research program for the main agro-ecological zones of the area.

Fields of investigation include agro-climatology, agronomy, agricultural engineering, socio-economics, rural development, and administration and planning. The program is expected to last for three years. During the first year detailed studies of six villages will be made, each village being representative of a distinguishable agro-ecological zone and form of agricultural organization.

Researchers will live for some time in selected villages to work closely with the farmers while they study climate, soil, crops and farm operations.

This approach should ensure a two-way flow of information between researchers and farmers so that the priorities of the programs at the main ICARDA site relate to the needs of the majority of the region's farmers, many of whom operate under marginal conditions. Later the program will include the development of alternative technologies, where appropriate, and with the full participation of farmers. "Any new systems must be developed within realistic farm environments, not in isolation with the intention of imposing them on existing farm structure," say socio-economist

Adrian Martin and agriculturalist Jim Harvey.

No less important are the training and communications components, that will be run by Shawki Barghouti, a Jordanian, who is both an agriculture and a journalism graduate. This program will bring together field workers from various countries in the region to discuss strategies for research and development, to identify problems at the local level in each country, to study the interdependence of physical, biological, economic and social factors affecting crop improvement, and to introduce, when relevant, methods of extension work to shorten the time-lag involved in the adoption of new technology by farmers.

Mr Barghouti's responsibility will also extend to the production of technical newsletters and periodicals related to the various ICARDA research programs, so that results are made available to scientists elsewhere, who may at the same time benefit from, and contribute to, this research.

Now that the Aleppo land donation has been approved by the Syrian parliament and signed by the President, the pace at this major ICARDA site has picked up. In September the IDRC, which had acted as the executing agency for the establishment of ICARDA completed its mission, and site development was underway. ICARDA at the present has an international staff of about 40, headed by Dr H.S. Darling, who has relinquished his post as principal of Wye Agricultural College in England and moved to Beirut, ICARDA's administrative centre.

Trucks, tractors and bulldozers have now invaded the Aleppo site, dominated by a hillock atop which the remnants of an ancient Roman fortress can still be seen. Full development of this site will take several years.

Another station will be developed near Tabriz, in climatic conditions representative of the high plateaus with extremes of temperature between winter and summer. This rugged area of north-eastern Iran used to be part of the ancient kingdom of the Mannaians, which reached its peak during the 8th century B.C. and was devastated by Assurbanipal, King of Assyria, a century later.

This site, located at an altitude of 2,000 metres, has not changed much since that time. It is still covered with snow from November to May, and lean is the yield of the scattered fields where nomad tribes with their sheep and pack animals can still be seen as they travel along their vast transhumance routes through mountain ranges, winter snow and spring flood water, in search of grazing lands.

The nomads may stop now and then, in wonderment before the signs of a changing way of life: here, the road from Tabriz, where 500 or 600 trucks every day provide the background of man-made thunder as they carry their loads of Western goods to Teheran and beyond; and there, surrounded by snow, is rising a warehouse that will house the strange new people who might have come from another planet. □

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Sociologist Adrian Martin and Syrian assistant interviewing local farmer: new systems will be developed in consultation with the farmers.

PONDS REDUCE WASTES

Rowan Shirkie

Waste not, want not — the phrase has taken on a whole new meaning in these times of resource scarcity and environmental crises. A global effort now being mounted in Israel, Kenya, Malaysia, Peru, and Thailand will research ways of reclaiming and reusing one of the most precious and threatened of the world's resources. . . water. Under investigation is a system of wastewater treatment that combines low-cost sanitation with food production by using waste treatment ponds to raise fish.

Over the next two years, institutions in the five countries will be conducting experiments with waste stabilization ponds that exploit the natural action of bacteria and algae to remove human and industrial wastes from water. Researchers will also study the treatment and fish production capabilities of various types of these ponds under different conditions, with the health aspects of the system being given a special priority.

Waste disposal presents a considerable problem in rural and urban towns in developing countries, particularly those that cannot bear the high cost burden of the sort of treatment methods common in industrialized countries. Water scarcity, and growing concern over the health hazards and environmental damage created by inadequate collection and treatment of human and industrial wastes have further spurred the search for low-cost alternatives. Considerations of reuse or reclamation are beginning to become more and more important in the decisions to adopt types of disposal systems.

Stabilization ponds represent one of the best alternatives. They are efficient, relatively inexpensive to construct, and easy to maintain. Their mode of operation, which depends on favourable warm temperatures and full sunlight make them ideally suited to tropical countries. These characteristics, together with the potential for actual economic returns when given an extended use with aquaculture, make the system seem an unbeatable combination.

There are two areas to be investigated more fully before the potential of aquaculture in stabilization ponds can be realized on any large scale. The first involves health considerations — the need to eliminate or block any possible transfer of disease-causing organisms, pesticides, or heavy metals through the ponds by the fish raised in them. The second is one of design and operation. Ways of adapting ponds to accommodate aquaculture must be investigated.

Pollutants in wastewater can be changed by biological, physical, and chemical forces. Unstable organic wastes can be transformed into inoffensive substances by these agents; in other words, stabilized.

Organic material in stabilization ponds is decomposed by two bacterial processes: aerobic and anaerobic. Bacteria digest organic matter in wastes, converting it to energy and growing new

cell material. Aerobic bacteria require oxygen to grow, whereas strictly anaerobic bacteria cannot grow in the presence of oxygen. The "wastes" or byproducts of this bacterial action are gasses, inorganic, and organic compounds such as carbon dioxide, ammonia, organic acids, etc.

Aerobic bacteria prefer the surface layers of a stabilization pond, where they can obtain oxygen from the plant activities of algae. In addition to supporting the aerobic bacteria, algae also contribute to the stabilization process by using bacterial byproducts for their own growth.

Anaerobic bacteria exist in and near the bottom layers of the pond, where the heavier organic load of settled waste solids and the absence of oxygen provide the proper environment. Thus the type of stabilization pond most commonly used for waste treatment employs both aerobic and anaerobic action.

Although the initial treatment received in a pond removes many of the pollutants from wastewater, fecal bacteria and a range of viral and parasitic organisms still persist. Often a secondary pond, or series of maturation ponds are employed to further treat wastewaters before they are discharged. A properly operated stabilization pond system can remove more than 98 percent of the fecal coliforms in the wastewater. The majority of these micro-organisms die off under the hostile, competitive conditions of sunlight, temperature, lack of nutrients, and other predatory organisms in the ponds. A general rule of thumb in treatment is that the longer a wastewater is detained in a pond system, the greater the destruction of these pathogens. It is in the secondary and maturation ponds that researchers will conduct aquaculture experiments.

Fish farming based on ponds fertilized by human and animal waste has added millions of tons of food to the diets of people in Asia, where the techniques have been refined over centuries of practice. Adding fish to waste ponds instead of waste to fish ponds makes no radical departure from this widespread and well-understood traditional technology.

Wastes were traditionally added to aquaculture ponds as fertilizer to increase the production of algae, on which the fish subsequently fed. The most popular varieties of fish cultured in this way are Carp and Tilapia. Both grow rapidly under a variety of conditions, and offer high productivity levels. Carp yields of over 1000 kg/ha-year and Tilapia yields of over 2500-3000 kg/ha-year are often reported. Mixing species of fish with different feeding habits — polyculture — allows full use of the range of nutrients available in waste-fed aquaculture ponds: bottom feeders to feed on bottom detritus (waste residues), with phytophagous fish that can strain out microscopic algae from the water and harvest the byproducts of the

waste decomposition process in the upper layers of a pond.

Fish do not seem to be susceptible to infection by the same pathogenic bacteria present in wastes and wastewaters that cause disease in humans. They may however, carry some of these pathogens on their scales, or as undigested material in the gut. Some fairly simple procedures to remove this danger, such as holding fish in clean water for a time, cleaning and thorough cooking, will be tested as part of the present research effort. There are indications that the presence of fish in treatment ponds can improve the quality of the water. Aside from the direct action in removing wastes and algae from ponds through feeding, fish indirectly affect the stabilization processes. Removing algae by feeding changes the algae-bacteria relationship and the dissolved oxygen content in the water. Fish thereby join the food chain in a reaction that eventually causes a change in the water's chemistry, making it a still more hostile environment for pathogens.

However, much remains to be discovered about the effects and modes of transmission of heavy metals and pesticides that may be present in industrial wastewaters or waters polluted by agricultural runoffs. There is evidence to show that the toxic materials present in such wastes may accumulate in the tissues of fish that ingest them, and can be passed on to humans. Specific research in Kenya will examine the effects of wastes from a tannery industry on the performance of a stabilization pond system, and on the fish raised in it.

There are well-recognized hazards associated with wastewater reuse for irrigation purposes. The persistence of pathogens even in treated wastewaters may restrict its use in agriculture, as the pathogens survive to infect humans eating food crops. The health hazards to farm workers handling wastewaters are obvious. There is an additional danger of damaging the soils under wastewater irrigation, either through accumulation of heavy metals, or salts build-up that affects fertility. The prospects for irrigating non-food crops (thus largely eliminating the transfer of pathogens) such as cotton, tobacco, or trees are promising, and further research may develop this area of reuse.

The stabilization process and conventional pond design must be adapted to accommodate the different requirements of aquaculture and wastewater treatment. Stabilization ponds have been designed to achieve maximum treatment efficiency. Yet successful aquaculture would depend on adequate supplies of nutrients being present, nutrients that are the wastes and algae stabilization ponds are working to remove. Future designs must strike an operating balance between two uses.

Just as too little food in the pond would hurt fish production, the sudden influx of large quantities of raw wastes could kill off a fish crop, either by

introducing very toxic materials, or by causing the stabilization process to accelerate rapidly and exhaust all the available oxygen in the water. Because very little is actually known about an integrated stabilization/aquaculture system (although over the years a significant body of knowledge has grown up around the two independent techniques), much of the research being undertaken now is still basic.

The University of Malaya in Kuala Lumpur will use two existing ponds currently receiving domestic wastewater from a nearby housing estate, and construct four other ponds particularly for their experiments. The existing ponds will be subdivided and stocked with different combinations of fish at different rates, and the university team will begin a detailed study of the extended food chain created in the ponds. The experimental ponds will be fed "nightsoil" collected from low-income residential areas of the municipality. Maturation ponds receiving the treated effluent will be stocked with fish. In the Malaysian experiments, particular attention will be paid to the levels of pathogenic bacteria and parasites in the raw wastes, the ponds at various stages, the fish, and the treated effluent. Part of the project includes a survey of the traditional practice throughout Malaysia and Indonesia of dumping wastes in small household or village ponds, to determine their health and production characteristics.

In Israel, the Fish and Aquaculture Research Station of the Agricultural Research Institute at Dor will use four maturation ponds treating domestic wastes from a community of about 5,000 inhabitants. Researchers will study the effects of different rates of waste loading, and fish stocking and density rates. They will also study various aspects of the waste stabilization/fish production system under temperate climatic conditions, and the potential use of an aquatic weed (*Lemna* or "duckweed") for enhancing the treatment processes and providing supplemental fish feed.

In Kenya, research on five pond systems will be carried out by the Research Unit of the National Water Laboratory, Water Quality and Pollution Section, Ministry of Water Development in Nairobi. The ponds the Kenyan team will study represent a variety of loading conditions and treatment processes, including the treatment of mixtures of industrial and domestic wastes. One experiment will culture surface-breathing fish under highly-loaded, oxygen-deprived conditions. A special interest of this research will be in the concentrations of heavy metals and chlorinated hydrocarbons in the flesh of fish and other organisms raised in industrial wastes.

In Peru, the Pan American Center for Sanitary Engineering and Environmental Sciences in Lima will evaluate the performance of an existing stabilization

pond system, with the aim of developing design criteria for different loading and climatic conditions in Latin America. The Center will focus primarily on the potential for reclamation and reuse of wastewater in irrigation. The health aspects of wastewater irrigation will be a main concern, but the project will include studies on aquaculture and the impact on soils.

In Thailand, the Environmental Engineering Division of the Asian Institute of Technology (AIT) in Bangkok will use 16 fish ponds stocked at four different rates and maintained at four different algal feeding rates. The effluent from a high rate (primarily anaerobic) stabilization pond receiving wastes from the AIT campus will be fed into the fish ponds. As in the other experiments, the Thai team will closely monitor the characteristics of the fish and treatment at all stages, looking for means to design pond operations to optimize both fish production and wastes treatment. They will focus on the economic and engineering factors that would influence the system's usefulness to rural and urban areas of Thailand and tropical Southeast Asia.

Each project has its own expertise in the fields of economics, aquaculture, and sanitary engineering, and each will emphasise a different element of wastewater reclamation. Yet the research methods and the analytic techniques used to interpret the findings must be standardized in order that the results can be properly compared and built into a useable, comprehensive body of scientific information. At the same time, researchers must be kept abreast of any pertinent developments in one project or another. A program of training sessions and meetings that will bring researchers together to establish common methodology and exchange information is therefore an important part of the global research effort.

From a planner's or sanitary engineer's point of view, the stabilization pond as a method of waste treatment has the advantages of being efficient, economical, flexible in scale and operation, and well suited to the tropical conditions of many developing countries. But if they can be combined with fish farming or other agricultural activities, stabilization ponds may have another advantage more important than any of these others. For the people whose everyday lives would be changed, such ponds could make the advantages of proper collection and treatment of wastes as obvious and concrete as more food on their tables and more money in their pockets. The cooperation and support at the community level that this particular technology might be able to attract as a result make it much more likely to be able to deliver health and development benefits long after the planners and engineers have finished their work. □

'Try it, and tell me what you think'

Jean-Marc Fleury



Jacques Denis (left) weighing and classifying sorghum types on an experimental plot at CNRA.

"Once I was visiting a farmer in the area. He invited me to have a look at his field of sorghum. I collected a number of panicles and, on my return, weighed them in my laboratory. Exactly 114 of his panicles were needed to equal the weight of 100 of mine — although admittedly he had grown his variety without ploughing or fertilizers!"

Dr Jacques Denis, a plant geneticist from Haiti on assignment with the National Agricultural Research Centre at Bambey, Senegal, relates this anecdote to make a point. The farmer was particularly proud of this specimen, which produced 70 grams per panicle, and the plant was excellent.

However, this particular variety could only be grown at very low density, and would not respond to fertilizer. So the farmer's production was fixed at a very low level; half-a-ton per hectare while elsewhere sorghum production may reach three tons per hectare.

The farmer must increase his production if he wants to improve his standard of living. "But how do you convince him to abandon the plant he cherishes so dearly?"

For Jacques Denis, there is only one way. "You must go in all humility, with great sincerity, and tell him: Look, my friend, I've been growing this type. Try it and tell me what you think of it." The new variety, however, must bear some resemblance to the old one. The farmer prefers a tall plant because he uses the stalks to build his fences, cook his food and feed his animals. However, the more productive varieties of sorghum have a relatively short stalk since the nutritive elements of the soil are almost directly absorbed by the panicle. So the height of the sorghum must be reduced gradually

while increasing its grain-bearing capacity as quickly as possible. "When his income improves, he should have enough money to purchase inexpensive materials for his fences."

During the three years he has conducted research at Bambey, Dr Denis has carried out numerous cross-breeds to produce varieties that meet the farmer's requirements. He has imported hundreds from America, Asia and other African countries. He has crossed them, sown them, recrossed them and resown them. During the 1974 winter season he observed some 28,000 plants, retaining 355 of them. During the 1976 winter season he selected the seeds of 500 plants from amongst 10,000. He normally conducts three harvests a year, one during the rainy season, and two others under irrigation.

Dr Denis' research projects, supported by the IDRC, have two main objectives, namely, obtaining early varieties with a 90-day cycle, and obtaining so-called 'late' varieties with a 125-day cycle. The grain from the early varieties must be exceptionally resistant to mildew, since these plants must mature and ripen under rainy conditions. This allows the farmer time for ploughing at the end of the rainy season with the advantage that he is able to sow his peanut crop earlier. Production from the 'late' varieties must be comparatively higher. They seem particularly appropriate for the south-central region of Senegal where winter extends over a four-month period.

Selection by production is based on two models: high production per surface area, and high production per plant. In the first model the aim is to obtain panicles weighing only 20 to 30 grams, but with a density up to 180,00 plants

per hectare. Such a large number of plants offers an appreciable margin of safety and this type of production should suit the small farmer. In the second model by contrast, the target is only 50,000 to 80,000 plants per hectare. However, the panicles of these plants would weigh between 80 and 100 grams. Such sorghum would respond particularly well to fertilizers and would be more appropriate for the fairly sizable farm.

For selection on the basis of cycle and production, Dr Denis also tried to take into consideration resistance to mildew, insects, and *Ramulispora*, a serious foliar disease common in eastern Senegal.

After three years of research, he has obtained a 90-day variety with a short stalk about 1.5 metres in length, with an average of three tons per hectare. The 125-day varieties include a strain with a short stalk producing 2.5 tons per hectare, and a strain with a stalk 3.5 metres long producing close to three tons per hectare.

Such productivity clearly outranks the local farmers' performance. Certain problems do arise, however. For example, varieties with high production usually have a compact panicle. Unfortunately, this makes it a ready host for insects. It also offers a firm perch for ravaging birds. The variety grown by the farmers, on the other hand, produces a very pliable panicle and its spikelets are widely spaced. Insects cannot infest them and birds find them an uneasy perch. However, Dr Denis fully recognizes these problems and has already produced a fine, semi-compact, heavy-grain-bearing variety with long panicles.

His ambition, however, is not just to produce a sorghum variety which will be suitable for the small farmer. He hopes to communicate a little science to them also.

For example, even if the sorghum is self-pollinating (a plant which fertilizes itself because it possesses both male and female parts) some plants will be fertilized by others. The taller plants clearly have greater opportunity to benefit from this cross-pollination process and, consequently, nature seemingly favours plants with long stalks. If the farmer decides to adopt a variety with a short stalk, he must first learn to harvest the panicles with an eye to the wind. In this way he will maintain a degree of consistency in his seeds so that he can obtain a more uniform, and thus more marketable crop. If he is made aware of the role played by natural selection, he himself can then choose the most promising plants. "Right from the earliest beginnings," adds Dr Denis, "the farmer has performed a large part of the work of selection." □

Jean-Marc Fleury is a science writer with the Centre's Publications Division in Ottawa.

Changes in senior management at IDRC

Louis Rasminsky

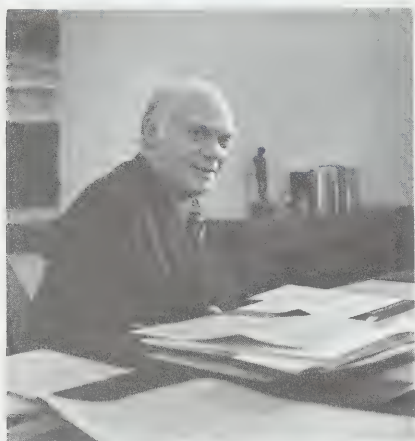


Photo: Malak

When Louis Rasminsky retired on his 65th birthday, he had just completed 12 years as Governor of the Bank of Canada, the culmination of an economic career that had begun some 40 years earlier with the Financial Committee of the League of Nations, the forerunner of the International Monetary Fund.

Many men would have been content to accept a well-earned rest, but Mr Rasminsky's "retirement" lasted less than two months. In March 1973 he became Chairman of the IDRC's Board of Governors, succeeding the late Lester B. Pearson. "On leaving the Bank of Canada I had hoped I would be able to carry on in some form of public service," he said recently. "I feel extremely fortunate to have had the opportunity of being Chairman of the IDRC for the past four years."

Now Mr Rasminsky is "retiring" again. The scene in his top floor office at IDRC's Ottawa headquarters was one of organized chaos, the Chairman was packing his personal papers, preparing to move on after completing his term of office. He took time out to reflect on the past four-and-a-half years.

"There are two things about the Centre in particular that strike me. The first is that the people who conceived of and set up the Centre had a very good and original idea. The second is the very high quality of the personnel and the governors of the Centre."

"This combination has achieved for the IDRC a place in the whole panoply of international aid organizations that is really quite special. What distinguishes the Centre from most other agencies is that it is helping others to help themselves, rather than giving straight material aid."

"The Centre's reputation is that it is both innovative and competent. As a result it has been catalytic in getting

other new research ideas off the ground — ICRAF (the International Council for Research in Agroforestry) and ICARDA (the International Centre for Agricultural Research in the Dry Areas), are two examples of this catalytic role.

"The future? I don't think the main thrust of the Centre's work is likely to change in the near future. The Centre will continue supporting innovative research in developing countries, tackling one new thing after another."

And what of his own future — does Mr Rasminsky plan real retirement this time? "Certainly not. I don't have any firm plans yet. In the immediate future I want to do some writing — but no, I'm not ready to retire yet."

Maurice F. Strong



The new Chairman of IDRC's Board of Governors is Maurice F. Strong, a man who has had a long association with the Centre, and is a leading Canadian figure in the fields of both international development and the environment.

In 1966 Mr Strong was responsible for Canada's External Aid program, and when that program was expanded to become the Canadian International Development Agency (CIDA) he became the Agency's first President.

In 1970 Mr Strong was invited to become Secretary-General of the UN Conference on the Human Environment, to be held in Stockholm, and subsequently was appointed first Executive Director of the UN Environment Programme (UNEP) in Nairobi. He returned to Canada in 1976 to become Chairman of the Board of Petro-Canada, the state-owned petroleum development corporation.

A member of the IDRC's original Board of Governors in 1970, Mr Strong rejoined the Board earlier this year. He has been a member or trustee of many other

international boards or committees, including the Dag Hammarskjöld Foundation, the Rockefeller Foundation, the World Wildlife Fund, the World Council of Churches, and the World Alliance of YMCAs.

W. David Hopper



Dr W. David Hopper, President of the IDRC since its inception in 1970, will leave the Centre at the end of 1977. He moves to Washington, where he will join the World Bank as Vice-President for South Asia.

In a letter to the Centre staff, Dr Hopper said: "The decision to accept the senior appointment at the World Bank was not taken easily or lightly," and he added, "The past eight years have been among the most enjoyable of my life."

Dr Hopper's new position will, in one sense, mark a return to earlier interests. In his own words: "Two decades of my professional life were devoted to the development problems of several South Asian countries, especially India. The Bank's activity in that region is an important element in the developing partnership that exists between the sub-continent countries and the industrial nations which provide them with the help and assistance critical to their economic advance."

A special committee of the Board of Governors has been set up to seek possible candidates for the Presidency. The outgoing Chairman of the Board, Louis Rasminsky, expressed his feelings this way: "David Hopper combines tremendous knowledge and experience of the developing world with a hard-headedness that has stood the Centre in good stead over the years. In addition he has been a real leader. . . an innovator. He will be a very, very difficult man to replace."

Science and technology serving development

Francisco Sagasti

Between 1973 and 1976, groups of researchers from ten countries in Africa, Asia, Latin America, and the Mediterranean worked together on the largest research project undertaken to date on technological policies for development. Entirely conceived and carried out by Third World researchers, the project is known as the STPI (Science and Technology Policy Instruments) Project. Now that the first phase of field research has come to a close, project activity has turned to making the research results public so that the government, university, and industrial sectors in Third World countries may become fully acquainted with them.

The idea for this project emerged during a meeting of Latin American officials from the science and technology fields held in Peru in 1971. The fact that the countries of that region had not, in the course of their development, created an effective demand for local technologies was one of the prime factors that prompted the creation of the project. Though most countries from this area had science and technology policies, there was little evidence to show that these policies had produced tangible results.

Thus, the situation pointed out the importance of studying the technological implications of a large number of economic and social policies. The problem was first analyzed in Peru and Argentina. Using these studies and the initial concern with technological implications as its groundwork, the STPI Project was organized. Taking part were Argentina, Brazil, Colombia, Mexico, Peru, and Venezuela. These six Latin American countries were joined by

Egypt, India, South Korea, and Yugoslavia.

The project's specific goal was to provide governments with information on the effectiveness of different policy instruments in the application of science and technology to socio-economic development. At the close of phase one in late 1976, the project had compiled some very valuable information. The partial results obtained in the course of the studies often were helpful in making decisions on scientific and technological policy in those countries participating in the project. The research teams were made up of university professors and government officials in an effort to guarantee an information flow between those who perceive the problems and those who offer solutions.

From the outset, the teams agreed to pursue the studies using a common list of sectors. These included the metalworking, iron, steel, food, petrochemical, and electronics industries. Thus, each country was able to do case studies in an area of particular interest to it — the mining industry in Peru, state enterprises in Brazil — and at the same time, they were able to gather information that was useful in exchanging experiences. In all of the studies, the current state of science and technology and the government's role in the formulation and implementation of technology policies were examined. The effect of these policies on the technological behavior of industrial enterprises and on research institutions was empirically analyzed.

The IDRC financed a large part of this project, especially the areas related to international and coordination costs.



Photo: Ron Poling

Brewery in La Paz, Bolivia: local beer, but whose technology?

The participating countries contributed approximately 35 percent of the total. The Organization of American States provided several of the Latin American teams with assistance, while Venezuela, India, and Brazil directly covered most of their own costs. The participating institutions were: The Science and Technology Commission of the Latin American Social Science Council (CLASCO), Buenos Aires, Argentina; the Studies and Projects Financial Institute (FINEP), Brazil; the National Science and Technology Council (COLCIENCIAS), Colombia; the Indian National Science and Technology Commission; the Korean Institute for Advanced Science (KAIS); the College of Mexico; the Peruvian National Planning Institute; the Egyptian National Academy of Scientific and Technological Research; the Venezuelan National Science and Technology Council; and the Department of Economy of the University of Skopje, at Macedonia, Yugoslavia. A coordinating committee, made up of representatives from each national team, met with the general coordinator every six months to review the project's progress.

The coordinator's office was in Lima, Peru, from 1973 to 1976. With the help of two professional assistants, the office also prepared comparative studies, training programs for several researchers, and studies on technological dependence, engineering firms, and the technology policies of Japan and the People's Republic of China.

The next phase of the project is the dissemination of the results of the studies, again with IDRC support. A number of publications — books and monographs — are in preparation including the methodology guidelines, the final comparative report, and the participating countries' summary reports. During the next year, seminars will be held for officials and researchers in Africa, the Arab countries, Asia, and Latin America to ensure that the results of this project, one of the largest of its kind ever undertaken, are used as widely as possible. □

Francisco Sagasti, a native of Peru, is general coordinator of the STPI project, and is now based at the IDRC's regional office in Bogota, Colombia.

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Michelle Hibler



Photo: United Nations/M. Grant

Janez Stanovnik: Do the industrialized countries have the right to use up all the oil before the rest of the world can benefit from it?

RGY ental ent ded

If it has often been said that the world cannot afford the growth pattern of the Western countries, in the field of energy it is increasingly apparent that the West can no longer afford itself.

The 34 European and North American countries included in the United Nations Economic Commission for Europe (ECE), in fact currently consume 75 percent of world commercial energy supplies although they contain only 25 percent of the world population. About half that energy is consumed in activities related to the development and use of human settlements.

In order to discuss means of reducing these settlements' dependence on non-renewable energy sources, some 140 scientists and planners from 24 European and North American countries and 12 specialized organizations met in Ottawa, in October, at a seminar organized by ECE. In the keynote address, Janez Stanovnik, Executive Secretary of ECE explained: "Settlements are built for years to come, for decades. Whatever we build today establishes a solid infrastructure for the rest of our lives, and probably for those of our children and maybe even of our children's children. Settlements in a way predetermine what will happen tomorrow," he said, warning that "If we are wrong in our calculations, we may well lay the foundations of future tension."

During the past 25 years, the world has known unprecedented economic growth: as production tripled, economic growth rates were sustained at five percent annually. Most economists will tell you that the most important factor influencing this development has been technology. But technological developments have become so energy intensive that what we believe to be their result might well be considered to be the product of cheap and plentiful energy. In fact, energy consumption tripled during the past 25 years and during this period we have burned as much energy as the human race had previously burned since Adam and Eve.

But growth and energy consumption have not been uniform the world over. The average five percent growth rate

means that some countries achieved 10, even 15, percent growth while others none at all.

The energy crisis of 1973, signalled a change in this situation. The fossil fuel reserves that enabled spectacular growth are now nearly depleted and energy is no longer as cheap a commodity. Growth rates have also slowed considerably. The consequences are serious, particularly for the human settlements that mushroomed because of economic growth and energy availability. Now, faced with a scarcity of both, they cannot sustain traditional growth patterns.

The West's high rate of energy consumption results in part from wasteful habits. As Mr Stanovnik pointed out, "If everybody in the world wanted to have the same per capita consumption of energy as we have today, the world would have to consume six times as much energy as we actually do." Energy economy and efficiency are therefore not only essential to safeguard the interest of present and future generations in the ECE region, he said, but should also be seen as a moral obligation towards the less privileged countries and peoples, and as a subject for global international action and cooperation.

The unequal distribution of energy reflects the great inequality that prevails in the world today. Except for the present oil-producing and exporting countries, the majority of developing countries are energy poor and cannot expect to increase substantially their production of conventional fuels.

"Should the presently developed world, by importing known reserves of the oil-rich developing countries, use them before the developing countries as a whole come to the point where they start using this energy in any larger quantities for their industrialization? In other words, shall we consume the oil before they have started to benefit from it?" asked Mr Stanovnik, adding that we have been doing so for the past 50 years.

While the seminar focussed on very concrete and practical problems in a regional framework, their implications are global and touch on the sensitive questions to be answered in considering a new international economic order.

The Chairman of the seminar and of Petro-Canada, Maurice Strong, who was formerly head of the UN Environment Programme and has recently been appointed Chairman of IDRC's Board of Governors, emphasized that the issues cannot be dealt with "without a fundamental re-thinking of the growth process itself, without a fundamental adjustment of our expectations of the growth process, and without some very basic changes in the content and direction of growth."

But what kind of growth are we to have? "It must be a conservation growth in which the resources are used rationally and in which nature is not destroyed," said Mr Stanovnik. And it must be growth with distribution and in which human values are promoted.

This growth will nevertheless need to be fuelled. While contradictory figures on conventional energy supplies abound, estimates show that at present world consumption rates, oil could sustain us for another 30 to 40 years. Enough coal exists for almost another 70 years and gas for a further 10. Considered together, best estimates predict enough conventional energy supplies for 79 years. But warns Stanovnik, "The shoe will start to pinch in 10 to 15 years." Consumption is rising at some four percent annually, faster than new resources are discovered. And if consumption rates are now lower than were predicted in 1972, so is economic activity. The initial drop occurred as a result of the energy crisis in 1973-74 and since then there has been further decline.

Hydro power and uranium 235 are also relatively limited, unless the uranium is used in breeder reactors, in which case it could last for 230 years. But breeders produce plutonium, a most dangerous substance with a life span of some 25,000 years. Stringent international controls would be required if breeder reactors were put into use. The use of such power is such a controversial topic that a number of countries, including Sweden and Denmark, have declared a moratorium on nuclear power development. And, says Stanovnik, not all countries will have nuclear fuel and a new system of world dependence would be created.

But there is an alternative, and one described throughout the conference as a most attractive one: conservation. This goes beyond fuel efficient automobiles and turning off unnecessary lights, although such apparently simple measures cannot be ignored. To truly conserve, cities themselves must be redesigned.

If the scientists' recommendations are followed, tomorrow's cities will be more compact and densely populated: suburbs will be curtailed as will the private automobile. The single family home, long considered an ideal, is rapidly becoming too expensive in actual and social costs.

The growth of cities will need to take into account the availability of different kinds of fuels and their distribution networks. Such growth may well follow a "corridors, clusters and centres" pattern where increased emphasis is put on mixed-use dwellings, centralized infrastructure such as district heating, more

Low-cost transportation in Asia: how to move people about at the lowest energy and environmental costs?



Photo: Neill McKee

public transportation and higher density dwelling units. Communication networks will have a greater role to play.

Local sources of energy, including the incineration of waste, may also be utilized, although their development will need to consider the local economy, the ecology of the area and possible dangers to the surrounding settlements. The seminar participants also recommended that energy planning, now a local or regional responsibility, be carried out at national and international levels.

Individual buildings within cities will also need to be modified. For new buildings, like new towns, this poses less of a problem since energy efficiency can be incorporated at the design and engineering stages. But 60 percent of the buildings that will be in use in the ECE region in the year 2000 have already been built. Designed at the time when energy considerations were neglected, they are largely inefficient and therefore present the greatest opportunity for savings. In fact, the participants at the seminar estimate that up to 37 percent of energy consumption could be saved by retrofitting the existing building stock — insulating walls, floors and ceilings, double glazing windows, changing or improving heating, cooling and air circulation systems.

New technology could also be introduced in these buildings to further savings and most countries are supporting experiments in the use of heat pumps, heat recovery systems, solar energy for space and water heating, and new heating systems using renewable energy sources.

As a delegate from the United States pointed out, however, buildings themselves don't use energy. The people in them do. And that is where the greatest change will have to occur. Consumer education campaigns have been launched but more will be needed.

Pricing policies, being considered and implemented, could also hasten the process.

There is the danger of course that the need for more rational use of energy will be perceived by some as a need for restrictions on personal comfort and aspirations. These attitudes above all will need to be changed. To do so, says Mr Strong, "involves a new approach to life in our human settlements, a new standard, a new set of criteria for measuring the quality of life, a new value system, cultural change, a change in the concept of growth itself. . . I'm suggesting something that does appear to be difficult in the light of current realities, but I would contend that it is both absolutely essential and it is not at all without precedent. . . it is how to make a transition to that new growth, that less physically-oriented, less wasteful use of physical resources, that less energy-intensive type of physical resources, that less energy-intensive type of growth that our main challenge lies."

"We are today in command of our own evolution" he told the participants, and "we shall create it as surely by our own neglect and by our apathy as we shall by conscious acts of will."

If the peoples of the ECE region can rise to the challenge, conservation will surely ensue and with it a new type of settlement where the quality of life is enhanced, not only for the people in the region, but for those of the developing world whose future growth depends on the restructuring of the western cities. □

IDRC and the energy connection . . .

"The energy connection links all nations" proclaimed a poster at the Habitat and Energy seminar, held in Ottawa from October 3 to 14. Organized by the United Nations Economic Commission for Europe as the most recent in a series of international meetings on human settlements and related issues sponsored by the UN, it had been proposed by Canada as a logical and necessary follow-up to Habitat, held in Vancouver in June 1976.

Of the 200 cities in the world with a population of over one million, more than half are in developing countries. And while they may presently use less, need less, energy than their northern counterparts, their needs are increasing as their populations swell and the expectations of their inhabitants evolve. The decisions that are being, and will be, taken in the area of human settlements and energy will unquestionably have a role to play in determining if these needs will be met.

The IDRC entered the field of energy this year by supporting a study of the existing and potential energy needs of Fiji's rural population. And although improving the well-being of rural peoples has been one of the Centre's main concerns, it has supported a number of urban-centred projects from which energy availability and supply cannot be divorced. Low-cost housing and sites and services schemes, for instance, will increasingly need to consider energy issues in their construction and in providing energy for household and transportation uses. The low-cost transportation study underway in Asia touches on an essential aspect of settlements planning — how to move people about, at the lowest energy and environmental costs.

But the energy problem is not uniquely urban. In many parts of Asia and Africa, wood is the main source of fuel and it too has been in short supply. IDRC-supported projects seek to alleviate this shortage and may, in the longer term, reduce these countries' need for costly imported fuels.

These and other projects, designed either to solve pressing problems or to provide planners with information on which to base development policies, may help to ensure that future growth in developing countries will avoid the errors committed in industrialized countries, errors whose magnitude is only now being fully appreciated. They may help these countries achieve, in Mr Stanovnik's words, "a somewhat different kind of development, for a different kind of growth" — growth that promotes human values.

BRIEFS

RESTOCKING THE GENE BANKS

Success in producing new high-yielding crops has reduced the possibilities for improved strains in the future, according to a British plant biologist. The high performance of hybrid strains that has done so much to improve world food resources, has also resulted in a much-depleted genetic bank to draw on for any further improvement.

Speaking to the British Association for the Advancement of Science recently, University of Birmingham plant biologist Professor J. G. Hawkes outlined the paradox. He said plant gene sources that had seemed inexhaustible were drying up, and that diversity for some crops had almost disappeared in Asia and Africa. Related wild species were also vanishing as their natural environment in forest and scrub were cleared, so less and less material for the genetic pool would be available from them.

Professor Hawkes said that despite the colossal problems of organization and financing involved, a well-organized world body was needed to oversee the problem of maintaining plant diversity. A start had been made, he said, with the establishment of the International Board for Plant Genetic Resources in 1974, and it seemed that a reasonable part of the heritage of crop plant diversity could be saved.

In order to save the world's plant genetic bank from liquidation, resources should be surveyed and all possible material collected, stored and made available to breeders. Scientists — particularly those from developing countries where most genetic capital still exists — should be trained in this field. Training programs should cover all facets of the problem including genetics, seed and tissue culture, and information handling, he said.

IT'S ALL DONE WITH MIRRORS

M. von Oppen, an economist at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in Hyderabad, India, has succeeded in capturing the sun and harnessing it to cook rice in 10 minutes, chicken curry in 20 and steamed pudding in 45.

This remarkable feat was accomplished with the help of a home-made "sun basket", a bam-

boo frame containing a parabolic papier-mache dish lined with shiny metal foil. The dish is formed over a plaster mould and reinforced with jute cloth. The size of the basket can vary, but the best results have been obtained with baskets of 1.2 and 1.4 metres in diameter, and with focal points of 10 and 20 cm respectively. The advantages of the smaller basket are that it is less bulky and its deeper dish better protects the cooking vessel.

The cooking vessel, black on the outside to absorb heat, and shiny on the inside, sits on a tripod at the basket's focal point, or is hung from two parallel bamboo sticks that cross the basket near the top. The basket itself sits on a "rocking chair" base that enables the cook to track the sun.

The materials and labour costs of the prototype basket amounted to less than 50 rupees (about US\$6.50), and Mr von Oppen believes that costs could be reduced significantly if the baskets were produced as a cottage industry, even at the rate of two per day.

He estimates that a family earning 200 rupees a month would save sufficient fuel to recover the cost of the basket in four months. In one year — given eight months of sunshine — they would show a net savings of 60 rupees.

HOME AWAY FROM HOME FOR COWPEAS

The five, new, improved cowpea varieties which were recently released to farmers by the International Institute of Tropical Agriculture (IITA) in Nigeria are unique. Specifically bred for the low altitude humid tropics, they are the result of research carried out in a completely different environment: Reading University in England.

If it seems surprising that the testing of a tropical crop is carried out in Britain's cool climate, the reason is simple: the pests and diseases that attack cowpeas in Africa are largely unknown in the British Isles. IITA can thus select the most resistant varieties and send them to Reading where the climate best suited to growing them can be determined. To conduct these tests in Africa would mean planting trial plots in several countries, making it difficult to identify which particular climatic factor was having the most effect on the plant.

At the Reading Plant Environment Laboratory, plants are grown in cabinets and glasshouses where climatic conditions are strictly controlled and can be regulated to

simulate almost any climate in the world. It has been found, for instance, that the start of the flowering in some varieties is very sensitive to the length of the day and to night temperatures. The daytime temperatures under which a crop matures also affect yields significantly.

Post-graduate students from Brazil and Tanzania are participating in the research program which is linked with IITA, ICRISAT in India and universities in other countries. The five new varieties are a large step forward in the development of this previously largely neglected food crop, but, says Dr Rod Summerfield who heads the program, much more research will be needed before cowpea's full potential is reached.

AGROFORESTRY COUNCIL HAS FIRST HEAD

Dr K. F. S. King of Guyana has been appointed the first Director-General of the International Council for Research in Agroforestry (ICRAF). The appointment was made during the course of a 2-day meeting of the ICRAF Board of Trustees in Ottawa, Canada, in October.

Dr King is Assistant Director-General of FAO and head of the FAO Department of Forestry. He is widely respected for his pioneering work on the concept of agroforestry

dam, the Netherlands, at the end of January to decide on a permanent location for ICRAF headquarters. The Council is currently hosted by the Royal Tropical Institute at Amsterdam. It is hoped that a suitable location for ICRAF will be found in a developing country by mid-1978, at which time the new Director-General will take up his appointment.

The Ottawa meeting drew up a preliminary outline of ICRAF programs, involving two areas for immediate action. The Council will begin to collect, assess, and analyse existing data on agroforestry, making efforts to pursue the largely nonconventional sources of information on this novel practice. At the same time, the Council will identify areas for productive research that are apparent from the present knowledge of agroforestry, areas such as the system's influence on soil fertility.

ICRAF was recently established on the recommendation of a working group of international experts assembled by Mr John Bene in 1975. The project identified research priorities for tropical forestry, among them the establishment of an international body to channel resources to properly protect and exploit the tropical forest for greater social and economic benefit. The project report has been published as a monograph, IDRC-088e "Trees, food and people: land management in the tropics."

INDIAN SCOOTERS SCORE

The buzz and crackle of motor-driven two-wheel scooters and mopeds may be the music of development.

In something of a commercial breakthrough, Indian-made motor-cycles are being exported to the USA, the country often regarded as the adopted home of the internal combustion engine.

The \$6.5 million deal for Scooters India of Lucknow was one of the more dramatic successes of a Buyer-Seller Meet that brought together American buyers and over 140 Indian manufacturing companies in Chicago for five days late this summer.

The meet was the third in a series organized by the Commonwealth Secretariat and India's Trade Development Authority, and was intended to assist Indian manufacturers win business in the US market. Similar export market development meets are planned for Kenyan and Jamaican manufacturers.



Photo: Don Gillmore

— an innovative land management system that combines tree crops with agricultural crops or animals.

The Board also appointed an Executive Committee consisting of Mr John Bene (Chairman), Senior Advisor to the President of IDRC; Dr S. M. Swaminathan (Vice-Chairman), Director-General of the Indian Council of Agricultural Research; Dr H. J. von Maydell, Professor of the University of Hamburg, Germany; and Dr Jacques Diouf, Executive Secretary of the West African Rice Development Association. The Executive Committee will meet again in Amster-

Third world needs agricultural development, not food aid say scientists

The IDRC's senior science writer, David Spurgeon, reports on a recent symposium on "Canada and World Food" held at Ottawa's Carleton University.

Among the speakers at the symposium were Dr W. David Hopper, President of the IDRC, and Ruth Zagorin, Director of the Centre's Social Sciences and Human Resources Division. Their respective topics were the politics and the sociology of food. Highlights of their presentations are included in these pages.



Photo: Agriculture Canada

Canadian wheatfields — keeping poor farmers poor?

The purpose of the symposium, sponsored by the Agricultural Institute of Canada and the Royal Society of Canada, was to consider "the world food situation as it relates to Canadian productivity, its economic circumstances, foreign policy and the extent to which countries may want our assistance."

A recurring theme was the need for developing countries to give greater emphasis to agriculture and food production in their national policies. There was considerable debate over the propriety of food surplus countries like Canada continuing to supply food aid (other than emergency relief) to developing countries, and a number of speakers said food aid should be tied to requirements that recipients do more to increase their own food production, but there was no consensus on this point.

There was general agreement, however, that world agriculture was capable of meeting the demand for food in the near future, and that the problem of shortages was essentially political in nature, rather than economic or even scientific. There was also agreement that much remains to be done. As Dr Frank Sheffrin, Director of the Canada Department of Agriculture's International Liaison Service, put it: "We have managed to avoid mass famine, but we have not been able to give a consistency to the efforts to overcome food shortages over time and in different parts of the world."

Dr Sheffrin added that just to maintain 1970 food consumption levels would require an annual increase in food production in the developing countries of 3.6 percent, compared to the present growth rate of 2.6 percent. Even if this objective were reached, it would still fall short of the goal of a 4 percent increase targeted for the second UN Development Decade.

Dean of University of Manitoba's faculty of agriculture, Dr Len Shebeski, said he believes agricultural lands in Canada have the potential for more than three times their present production of field crops, and more than 10 times the present ruminant livestock production.

But the cost of such development would be enormous, and he did not think food destined for developing countries should be produced in such a way. Instead he proposed that the Canadian government channel equivalent funds to developing countries to bring into production lands with huge agricultural potential, such as the Indus-Ganges-Brahmaputra plain of North India.

Dr Kenneth Hare, of the University of Toronto's Institute for Environmental Studies, added an ominous note when he spoke about the possible effects of climatic change on the world food situation. It is now clear there has been a genuine increase in climatic variability, he said, and he expects the variability to continue. These changes will continue to "rock the boat of agricultural production."

And Dr Nathan M. Kofsky, of the International Food Policy Research Institute in Washington, who predicted food shortages for half the world's population by 1990, added this grim warning: "It would be well to keep in mind that good weather and good crops such as have been the case in the last three years can, and likely will, give way to bad weather and poor crops. For those who live on the edge of hunger, the food crisis could be back again full blown."

THE POLITICS AND THE SOCIOLOGY OF FOOD

"At its core, the world's food security is a political not an economic or even a scientific question." This was the message that IDRC President W. David Hopper delivered to the symposium.

The politics of food, he said, involved more than economic development, economic growth, and the interaction between rich and poor nations: "Because it is a commodity charged with emotional symbolism as well as material substance, it has a special politics." Following are highlights from Dr Hopper's presentation.

- 'Revolutions and coups are made and executed in the cities by urban elites and urban masses. For Third World leaders political stability rests on keeping cities peaceful. This is accomplished best by providing employment, the products of secondary industry, and, above all, ample supplies of cheap food.'

- 'To offset a worsening food situation, some developing countries carried the exploitation of the rural sector to the point of importing food supplied by surplus-producing developed nations on concessional terms, to ensure the continued availability of cheap grain to urban consumers. They held domestic farm prices well below levels that would have prevailed had the imports not been available, destroying the incentives higher farm receipts would have had on generating local increases in food production.'

- 'The experience of Taiwan, South Korea, Brazil and a few other non-OPEC Third World nations that have attained sustained high rates of economic growth, suggests that a prospering rural population is an important, if not vital, stimulant to a buoyant national economy. If further analysis bears out the hypothesis. . . the old two-sector model and the policies of rural exploitation it still spawns will be seen as an anachronistic, although costly mistake.'

- 'The Gangetic basin would require perhaps as much as \$60 billion to unlock its full agricultural potential — a potential that could add 80 percent or more to present world grain output. Without massive external help from the wealthy nations, significant rural development is. . . a dream.'

- 'Until the FAO is forced to take its mandate seriously, there will be no strategic plan. The result will likely be more waste and duplication. . . the usual chaos of ad hoc, unplanned, and uncontrolled investment activities. Hardly a program to generate political enthusiasm, or even much political interest.'

- 'I do not see the major food-exporting countries. . . ever using food as a significant political weapon in their relations with other countries. I do not believe that the governments of these countries could long survive the public revulsion that would arise if, by their actions, food was withheld from starving people, regardless of the provocation, short of a state of war.'

- 'Underlying Third World demands for a new international economic order is the drive to shift economic events from the international marketplace to the arenas of world politics. We hear of bauxite and banana and coffee and copper cartels, and of special arrangements for supporting balance of payment deficits and handling nonconvertible currencies, all part of the call of developing nations for a new international deal.'

- 'It is difficult to bring the politician and the scientist to a common understanding. Each deals with limits. It is difficult to convey to the scientist the practical reality of limits to political action; just as it is difficult to convince the politician that science has. . . tight limits on what can be accomplished. Political problems will not evaporate with an improved understanding on both sides, but a better comprehension by each of the constraints acting on the other would do much to focus the work of each on those matters that will yield to a complementary attack by both.'

*The full text of **The Politics of Food** is available as an IDRC monograph. See page 23 for details.*

The role of the individual and of rural society in the process of modernizing traditional agriculture was the theme taken by Ruth Zagorin, Director of the IDRC's Social Sciences and Human Resources Division in her presentation on the sociology of food.

Dr Zagorin presented a strong argument for leaving agricultural production in private hands, while encouraging cooperative action. The costs of substituting social goals for food abundance, she said, were simply too high. Following are some of the key points of her address.

- 'In most traditional rural communities the distribution of wealth in the form of land and capital among its members is highly skewed in favour of a few. But this distribution is seldom reflected or even approximated in the distribution of the economic income produced by that wealth, which is much more equally shared among all members of the community.'

- 'The products of the early industrial era were brought by the colonial powers to Asian and African territories. The gates opened to a flood of products that competed directly with traditional goods, or were totally new. These goods absorbed real resources from the community that would have been distributed internally had they not been used for imported purchases.'

- 'In some countries rural schooling has greatly expanded, and the barriers of illiteracy to communication with the outside world have fallen as radio, and in a few cases television, have opened vistas of a life unknown to traditional heritages. The exposure to new knowledge. . . has created desires among the rural people, especially the younger members of the community, for both more material benefits and for altered forms of social organization.'

- 'The basic desire of rural people in developing societies is to increase their economic well-being, not only in terms of traditional consumption patterns, but also to participate more fully as producers and consumers in the national economic systems. Rural people have been left frustrated as consumers and held within the confines of traditional methods of farming as producers.'

- 'China solved some of its rural difficulties by enforcing collectivization on its farmers. But collectivization did not occur without violence, and even now individual freedom is sharply circumscribed. In countries preserving individual freedom there is evidence that increasing food production through the application of scientific technologies is accomplished best when individual farmers make private decisions on how they will handle their land, labour and tools. Essentially this is capitalistic agriculture.'

- 'The growth of rural population and the already small size of many traditional farms entail great diseconomies of scale in the application of modern farm technologies. To overcome these diseconomies, there can be strong incentives for private farmers to build social systems that enhance their market bargaining power and provide them with effective control over resources that are not made available easily to any one individual.'

- 'If there is a distinct sociology of food, it arises from the interaction between social organization and the transformation of traditional agricultural systems to those incorporating modern applied technologies. The impact of social structures upon this transformation, and the effect of the transformation upon the traditional social structure are the central elements in the development question: "What kind of a society and a nation do we seek to build?"'

*The full text of **The Sociology of Food** is available as an IDRC monograph. See page 23 for details.*

'Peasants in the cities' play a useful role

Y.M. Yeung

In many cities in Southeast Asia, as elsewhere in the Third World, a significant proportion of the demand for goods and services is met not by shops and supermarkets, but by hawkers and vendors — the often colourful street traders who are a familiar sight in most major cities.

In situations where urban unemployment and underemployment are a social problem and the tide of rural-urban inflow continues unabated, hawking and vending often provide viable occupations for many less skilled and educated people. They are also effective as final distributors of certain commodities, notably vegetables and unprocessed foods.

There is another side to this story, however. Many see the hawkers and vendors as a problem group, obstructing both vehicular and pedestrian traffic, creating unhygienic conditions, and posing unfair competition to legitimate merchants in shops and other businesses.

Both viewpoints obviously contain some truth, but they tend to be based on opinion rather than fact. For in spite of their historical and contemporary importance, little was known until recently about hawkers and vendors, the nature and role of their activities, even their numbers.

In an attempt to better understand the hawker and vendor phenomenon in Southeast Asia, the IDRC supported a multi-country comparative study focusing on six cities in three countries. These were: Jakarta and Bandung in Indonesia, Kuala Lumpur and Malacca in Malaysia, and Manila and Baguio in the Philippines. The study also expanded on data and experience gained in earlier researches in Singapore and Hong Kong, some of which was contributed by the coordinator of the Centre-supported study, T.G. McGee.

The study was aimed primarily at understanding the role of hawkers in the marketing system in each of the cities. It entailed both an enumeration of the total numbers and types of hawkers in each city, as well as detailed studies of a cross-section of individual hawkers and vendors.

It was estimated that the total number of hawkers ranged widely, from a low of 765 in Baguio, to a high of 50,000 in Jakarta. This wide range reflects in part the very large differences in the size of population of the cities under study. It is accounted for, too, by the varying roles hawkers play in each urban distribution system.

The figures are only estimates — the enumeration in Jakarta, for instance, was based mainly on areas of hawker concentration, leaving most of the small groups and itinerant hawkers unaccounted for. But the data collected in these surveys, together with similar survey findings in Hong Kong and Singapore, do shed considerable light on the hawker situation in these cities.

The findings on the hawkers' personal characteristics strengthen the view that hawking is a "refuge" occupation. Most hawkers have received up to six years of education, and are predominantly male, with the exception of the Philippine cities, where the majority of hawkers are women.

One of the stereotypes of hawking is that it provides an entry into city life for rural in-migrants, who often arrive in the cities lacking in education, special skills, and capital. Hawking and vending provide them with a living, it was said. Surprisingly, only Jakarta really fits this stereotype, according to the study. In all the other cities surveyed, a large proportion of the hawker population consists of native-born city residents who have been hawking for many years.

In Hong Kong and Singapore, where internal migration is much more controlled, the hawker community is well entrenched. Almost 61 percent of Hong Kong hawkers, for example, have been in business for over 10 years. Most had never worked at any other job. A large number of those interviewed indicated that they had taken to hawking for negative reasons (such as lack of other job opportunities). But a significant proportion cited positive reasons, and some successful Singapore hawkers even said they would encourage their children to continue the family business.

Hawkers operate in different fashions, and sell a variety of goods and services. Some move from place to place to sell their wares and services. Others operate from fixed locations. The survey findings indicate that the majority of hawkers fall into the static or semi-static categories, selling a wide range of goods from processed and prepared food to non-food items. Many have a regular clientele.

Most of the hawker units (80 to 90 percent) are individually or family owned. Family and kinship bonds are fully utilized in the economic operation of these businesses, so that regular paid assistants are seldom employed. The hawkers may or may not pay a licence fee to the city government. The daily incomes of most hawkers are small, with two-thirds falling in the marginal and



Photo: D. van Praagh

sub-marginal categories. They usually work long and irregular hours.

The value of an individual hawker's stock is generally low — a large stock requires capital, and there is also the risk of confiscation if he or she infringes upon the rules, or is unlicensed. Most of the goods sold are obtained within the city, and very few originate outside of the country.

Many of these features are typical of a pre-capitalistic peasant mode of operation. No wonder that hawkers have been referred to as "peasants in the cities". However, hawkers do perform a useful service in the urban community by keeping the cost of living down with their cheaper goods and services through lower overheads. The profession also provides gainful employment where job opportunities are limited, and offers a training ground for the development of entrepreneurial skills.

Generally speaking, hawkers and vendors are found at places of high population concentration, such as markets, cinemas and other public places. However, the surveys also revealed distinct ecological niches in the cities where the hawkers operate to cater to a consumer market not otherwise adequately served by the regular city distribution system. Hawkers enhance their viability by maintaining spatial and temporal mobility. The system of travelling night markets in Singapore attests to the hawkers' ability to identify gaps in consumer demands and respond to changes in market conditions over time. In the surveys, 40 to 50 percent of the hawkers lived within ten minutes' walk from work to reduce travel time and cost. The customers, most of whom are regular, are mainly from the immediate neighbourhood. These patterns of restricted trade area, neighbourhood clientele, and regular patronage likewise emerge strongly in Hong Kong and Singapore, where attempts to relocate hawker operations by a distance of a few

blocks have resulted in sharp declines or even failures in business. This negative effect of policy intervention is exemplified in the case of the raw food hawkers in Hong Kong who have articulated well to the neighbourhood daily needs on account of a poorly developed system of public markets in the urban area. Similarly, the resiting of the Wednesday Orchard Road night market in Singapore to the present Tanglin Road site less than a mile away has caused business to decline.

It should not be assumed from the above that the hawkers are a homogeneous section of the urban community; it must rather be emphasized that hawkers are in fact a highly heterogeneous group. Just as economic conditions in Southeast Asian countries vary widely, the hawker situation reflects and is inextricably tied to the stage of economic development of a country, and differs markedly in the countries under study. Although many stories portray hawkers as having made a fortune in their business, they constitute, by and large, a low-income stratum of the urban population. Government policies directed at hawkers would necessarily have to be different in each country and, in fact, in each city within a country.

Indeed, hawker policies pursued by the various city governments do diverge substantially, depending on developmental priorities and levels of economic growth. The recent experience of Hong Kong and Singapore is relevant here. In a condition of labour surplus in the immediate postwar years, both Hong Kong and Singapore saw a rapid increase in the number of hawkers. The official policy towards hawkers then was negative, but arrests, jail sentences, and stiff fines failed to provide a solution. Gradually, as economic progress was made the problem receded and the administrators adopted a correspondingly more positive attitude towards the hawkers by providing the space and environment for them

to operate.

This policy is being pursued slowly in Hong Kong, but the recent decision by Singapore to resite all hawkers in the Republic in permanent and sanitary hawker centres is the culmination of this policy. Both recently, however, experienced a labour shortage, and policies have been formulated to check the growth of the hawker sector in order to redirect available manpower to industries. Thus, in Hong Kong industrialists and their spokesmen have suggested policies designed to speed the entry of hawkers into the proletariat. Similarly, since 1969, able-bodied individuals below the age of 40 in Singapore have been prohibited from obtaining a licence for hawking.

Within Southeast Asia, Malaysia appears to have adopted a most positive and benign policy towards hawkers. Hawking or petty trading is seen by the Malaysian authorities as an avenue through which the *bumiputra* (indigenous population, i.e., Malays) can participate in the hitherto immigrant-dominated marketing sector. This policy is consistent with the objective of restructuring the Malaysian society by assisting the Malays economically, a major policy goal of the Second Malaysian Plan (1971-75). Consequently, institutions such as the Mara Institute of Technology offer courses in commerce which can be of use to petty traders, and loans on easy credit terms to hawkers.

In other surveyed cities, official attitudes towards hawkers generally tend to be negative. In Manila and Jakarta, for example, hawkers are constantly removed, though to no visible effect. Their useful services notwithstanding, the hawkers pose a great problem because of their large numbers, but with many more pressing issues that primate cities like Manila have to contend with, the hawker problem is relegated to low priority. However, a re-assessment of developmental priorities, which at present tend to favour the modern sector with more visible developmental returns, seems warranted. The need to develop the traditional sector appears to deserve more official attention than is presently given. □



Opposite: hawkers provide a cheap source of fresh vegetables for city dwellers. Above: street market in Kuala Lumpur — blessing or blight?

Y.M. Yeung is co-author with T.G. McGee of *Hawkers in Southeast Asia — Planning for the Bazaar Economy*, recently published by the IDRC. Details on p.23.

A case for conditional optimism

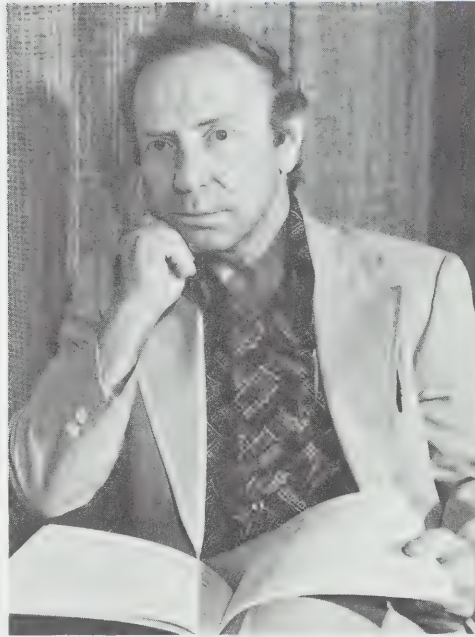


Photo: Neill McKee

Daniel Hillel is a Research Fellow with the International Food Policy Research Institute in Washington. He emphasizes that the views expressed here are his own, and do not necessarily reflect those of the Institute.

For over a decade now, we have been battered again and again by a seemingly endless succession of inescapable problems and crises which has shattered our former complacency and our faith in an orderly civilized world and in the attainment of a full life for all the world's people. Among the problems which threaten to overwhelm the international order are the population explosion, the pollution and degradation of our environment, famine, civil strife and terror, proliferation of nuclear weapons, youth disaffection, energy shortages, inflation, the apparent failure of democratic leadership and of international institutions. . . Long indeed is the list of our woes!

Is there hope for mankind?

Only two decades ago, we all would have answered with a ringing affirmation of mankind's positive destiny. After all, faith in the essential goodness of man and the efficacy of progress had been a fundamental tenet of our culture for many generations. Yes, there are problems, we would have readily acknowledged, but we can solve them all in time through education, research, technology, legal and social reform, planning, organized institutional action, and the eventual attainment of international goodwill and understanding.

For centuries, it seems, ever since the onset of the the industrial revolution, the concept of progress had been the guiding principle of Western civilization. By the very nature of human history, we thought, every generation must somehow improve upon the preceding one. Almost by definition, history is a journey of progress, in the course of which mankind rises higher, qualitatively as well as quantitatively.

Now, suddenly, we are not so sure. A host of crises negates our hopes. We are plunged into a malaise, an anxiety, an uneasiness. It seems that our journey has taken us to some fateful boundary, beyond which lies uncharted and dangerous ground, a hostile terra incognita. Few of us can muster the optimism to look on today's crisis as a temporary setback, a momentary pause in our headlong voyage, merely a waystation in which we might gather new energy in our continuing quest to attain ever greater heights and view wider horizons.

The pessimists who seem to dominate the intellectual community predict the decline of our civilization, and, as was the fate of Rome, expect us to be plunged into another dark age. Before our very eyes, they have transformed the prevailing perception of history from a bright promise to an unavoidable disas-

COMMENTARY

by Daniel Hillel

ter. "We've seen the best of the game," said novelist C.P. Snow, while historian Arnold Toynbee predicted that the developed countries will soon find themselves in a state of permanent siege, in which even the material conditions of life will become increasingly austere.

In the face of this profoundly pessimistic perception of reality, the first victim is likely to be the moral and spiritual equilibrium of our society. In times of stress and adversity, some relatively prosperous individuals or nations, feeling threatened, may be tempted to seek advantage by setting themselves apart and aloof from the remainder of mankind. There are plenty of smug and self-righteous ways by which to rationalize such an attitude. I have recently heard a presumably serious academician, speaking before a large audience in a major university, make the startling statement: "If those people," obviously referring to those *developing countries*, "insist on producing endless masses of human protein, we ought to simply leave them to wallow in their own misery." I note regretfully that this cruel statement was greeted with applause.

Can rich first class passengers (to use a currently popular metaphor), on a train rushing toward doomsday, with more and more third class passengers clambering aboard and hanging on the doors, go on eating and drinking while oblivious to those knocking on their windows? And, even if the first class passengers could close their shutters and survive physically, what about their moral survival?

Foremost among mankind's present woes is the population-food crisis. Population seems to be growing uncontrollably, especially in the under-developed nations of South Asia, South America, and Africa. We are told by statisticians that within a century these nations could attain a population of 30 billion or more, unless famine or war or (at best) stringent family regulation reduce these numbers. Meanwhile, food seems to be running short. There are reports that fish catches are declining. Western man continues to feed grain to cattle while people in drought-stricken areas of the underdeveloped world clamour for a bit of that grain for their children.

Increasingly, the answers searched for become regional rather than local, global rather than national. And there are no easy answers. Beware of those who will tell you that science and technology will soon solve it all. Beware of those who tell you that there is no solution and that some nations are

already doomed. Both views are simplistic at best. At worst, they are cop-outs, ruses used to cover up an otherwise inexcusable tendency to evade the real problems of the day.

Especially dangerous are those who find it fashionable to spread despair and thus lull us into a state of resignation and inactivity. They say that the green revolution, which only five years ago seemed to be such a success, has failed. They say the world has no more arable land to bring into production. They say the climate is changing for the worse. And they say pollution is an inevitable consequence of population growth and is spreading inexorably. Moreover, they say that food production will necessarily decline, as increasing scarcity of energy will drive the cost of fertilizers, pesticides, tillage and pumped water out of the reach of many marginal farmers. The problem seems so overwhelming that we instinctively recoil from its very enormity.

The most prestigious and influential of the doom criers have based their projections on the computer model contrived by the high-sounding "Club of Rome." The assumptions upon which this model was based are exceedingly questionable and in fact pre-determine the results. Notwithstanding the fact that various scholars have refuted this model (in the process, demolishing it in excruciating detail), it seems to have gained currency in numerous publications, in the mass media, and even in the schools. Its dismal and forlorn conclusions have almost become part of conventional wisdom, quoted and re-quoted again and again.

More and more, we see and hear reference to Reverend Thomas Malthus, who, in his *Essay on Population* published in 1798 first advanced the thesis that population growth will inevitably outstrip food supply. Since Malthus has been dead, and quite wrong, for over a century and a half, it is rather amazing that his view of man's fate should gain such popularity and become the truistic mainstay of current opinion.

There is, however, an alternative proposition, which draws quite a different picture of the future, and yet is at least as plausible. It is that the earth can support a population considerably greater than today's. Population growth is in any case slowing down (prosperity being the most universal and proven contraceptive). The current shortages are not the inevitable result of any fundamental scarcity of resources, merely of poor management. We've only scratched the

surface of the earth's resources, which are potentially enormous. Pollution is not irreversible, and is in fact controllable once it is recognized and the will is mustered to do the job. And while we cannot expect the rich nations to give up their wealth or the poor nations to wrest it away by force, we can expect a greater measure of cooperation and concerted international action to increase food production and alleviate hunger.

The history of mankind has always been a race between the acquisition of new knowledge and the threat of disaster. The form of the disaster looming over mankind has changed repeatedly, like a many-headed dragon. Once it was pestilence, then famine, then environmental degradation, and once again famine and new outbreaks of disease. Mankind's problems can never be solved once and for all. We must continue to search and re-search to acquire the knowledge and then take the necessary action to solve the problems which arise anew or exacerbate from time to time. By recognizing and solving the problems early enough we can head off the threat of disaster. This belief was a commonly held article of faith during the first half of this century, but is seldom heard today in respectable forums. I submit that there is much to be said for it even now.

One of the real reasons for today's shortages of food is the failure of the world community, including the producing and consuming nations alike, to prepare for the eventuality of occasional crop failure resulting from drought or other vagaries of nature. The world has neglected the wisdom of Joseph the Provider, who had the foresight to store the surplus production of good years so as to tide the economy of ancient Egypt over the bad years, thus moderating the sort of sharp fluctuations which we have witnessed in our own generation.

I would not be so confident about the potentialities for solving the world's food problem if I had not witnessed and taken part in the development of agriculture in the State of Israel. In the year 1946, a UN commission was appointed to deliberate over the fate of the country, and in the course of its inquiries it received "expert" testimony purporting to prove that the country's productive potential had already been reached and that there was no more arable land nor water to permit any substantial increase in production (and hence in population). When Israel was established two years later, its population was about three-quarters of a million, and it was barely able to produce half its food requirements.

Now, one generation later, the population of Israel is almost five times as great, and its agriculture is now producing, either directly or indirectly (i.e. by exporting and earning), the entire food requirements of this vastly greater population. In other words, agricultural production in this one country has been multiplied tenfold within less than 30 years. This is indeed a remarkable achievement.

To be sure, it was not an easy task. It would not have been easy even if the country did not have to contend simultaneously with a multitude of other problems with competing demands upon its manpower and other resources. Nor were the physical conditions particularly favourable. Perched between sea and desert, the country is subject to shifting climatic patterns with a high incidence of drought. Moreover, the land had been ravaged by erosion for centuries as the once-terraced hillsides had been overgrazed. (It has been estimated that a mantle of soil one yard deep has been washed into the sea by the resulting accelerated erosion). In fact, only about 25 percent of the country's approximately two million hectares are in any way arable, the remaining soils being either too shallow, too steep, too stony, too saline, or too parched to permit cultivation. Yet the job was done, and that is sufficient proof that it can be done elsewhere, though perhaps not in the same manner or to the same degree.

But how was it done? The answer may seem deceptively simple: through trial and error (and at times it seemed there were more errors than trials), search and re-search, in a persistent, and still continuing, quest for better ways. Methods had to be devised to cultivate each soil type specifically, including loose sands and ill-drained clays, and to determine which crops and cropping sequences are optimal. After exploring every possible source of water, the country was able to utilize more than 90 percent of its renewable water supplies, including streams, springs, underground aquifers, and lakes. One of the first laws passed by the new state was a comprehensive water law, strictly regulating the pumping of water from each well so as to prevent the progressive lowering of the water table along the coast and the resulting hazard of seawater intrusion.

With water so precious, a painstaking effort had to be invested into increasing water use efficiency in irrigation. The age-old practice of flooding over the land or impounding water in furrows

was quickly abandoned in favor of more highly controlled methods of application such as sprinkling. Ultimately, an ingeniously simple method was devised, called trickle irrigation, by which water is provided to crops (including large trees) drop-by-drop, in the manner of spoon-feeding babies, at a precisely measured rate to answer the climatically-imposed demand and to prevent salinization while maintaining a nearly optimal condition of soil moisture continuously. Fertilization techniques had to be tested for each crop and soil, including the technique of injecting the nutrients into the water supply. Improved strains of animal and plants were imported whenever suitable, or bred locally. Methods of weed and pest control specific to the country's conditions were developed, with due attention to the hazard of environmental damage. Other innovations related to climate control (e.g. the use of plastic covers and greenhouse culture) as well as to harvesting and storing produce. Nothing, in fact, could be overlooked.

In the course of its agricultural development, Israel was aided greatly by the extraordinary diligence and ambition of its new farmers — men and women who had no background in farming and hence, unbound by traditional methods, were ever willing to try new ways. In many cases, these self-educated farmers, particularly on the collective farms, conducted their own research and forged ahead of the scientists in finding new and better ways.

Israel's achievement can be duplicated, and even surpassed. A case in point is the agriculture of the Arab sector of Palestine, which, taking advantage of the Israeli experience, advanced even faster to close what seemed like a gap of centuries within a single decade. Other countries have made equally remarkable progress. An outstanding example is Japan, which, although located in the very northern fringe of the rice growing belt, and would therefore be considered *a priori* to be marginal, actually produces an average rice yield five times greater than that of Bangladesh where conditions of soil and climate are nearly optimal for rice. Bangladesh itself, once it solves its internal problems and organizes for action, can undoubtedly surpass the Japanese achievement. I have had some pertinent experience in Burma, among other places, where grain yield of six or more tons to the hectare were shown to be possible in a region where only shifting cultivation had been practiced, yielding no more than a tenth

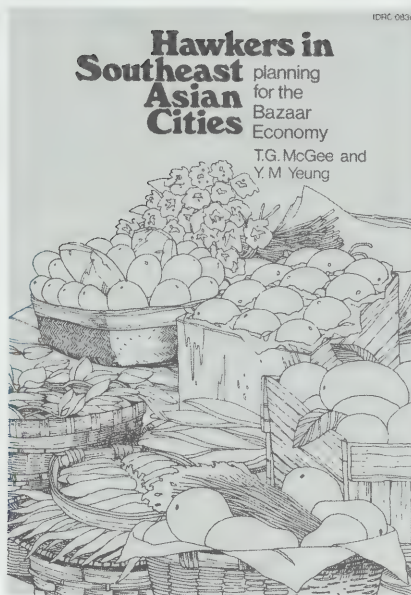
of the potential. There is, of course, a significant mutually causative correlation between a country's productivity and its educational level, notwithstanding the abundance or paucity of natural resources. Some of the most richly endowed countries are among the poorest, and vice versa.

The crucial problem of increasing food production lies not in the Malthusian realm (namely, the existence of an inherent limitation on the rate of production increase), nor in the neo-Malthusian realm (limited resources), but in the human realm. Here, again, it is not in the population growth *per se* (though excessive population growth can certainly exacerbate the problem — that much is obvious), but, ultimately, in the ability of each nation to muster its collective will and mobilize its resources to carry out an effective program of agricultural and general economic development, as well as in the ability of the entire family of nations to cooperate in this common goal. We come finally to the most important question: is the international community ready to stop squandering the most precious of all resources — human effort — in the futile and vainglorious pursuit of military power, and begin applying to education, population control, agricultural and economic development that which is now wasted on the means of war? (It seems totally incredible that the total global annual investment in agricultural research and development amounts to less than one percent of the total spent on armament).

As an agricultural and environmental scientist, I am convinced that we have the essential knowledge and capability to fructify barren lands and feed all of humanity even allowing for the inevitable portion of expectable population growth. Yet not enough is done at present, and not enough will be done until a new spirit of collaboration rather than strife begins to pervade this global village. It is here that my basic optimism occasionally falters. Perhaps we are destined to witness and suffer harder times before the necessary attitude evolves and the necessary action is taken. Perhaps the new approach will arise only out of even more dire adversity. But it will, as it must.

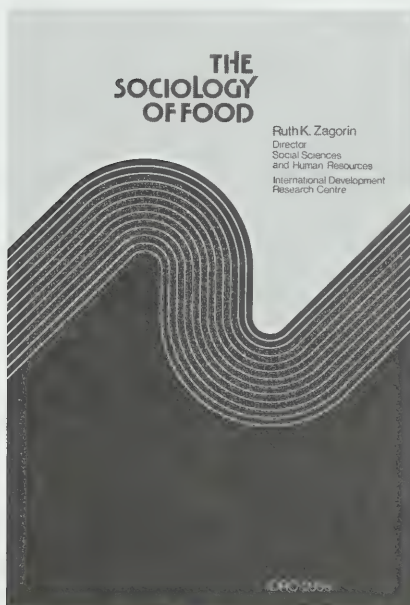
When the problems loom too formidable to solve in our own lifetime, I am reminded of the ancient adage: "It is not for you alone to complete the task, but neither are you free to evade it." □

New publications



Hawkers in Southeast Asian Cities: planning for the bazaar economy, by T.G. McGee and Y.M. Yeung. Published December 1977, 139 pages, IDRC-083e.

Are hawkers a blight on the modern city? Are they a necessary evil? Are they an essential part of the character and economy of urban Asia? These and related questions are considered in the first authoritative multicountry report on the subject, based on an IDRC-sponsored study of hawkers and vendors in six Asian cities — Baguio, Bandung, Jakarta, Kuala Lumpur, Malacca, and Manila.



The Sociology of Food, by Ruth K. Zagorin. Published December 1977, 12 pages, IDRC-99e.

The full text of a paper presented by the Director of IDRC's Social Sciences and Human Resources Division at a symposium on Canada and world food. See p. 17 for more details.

The Politics of Food, by W. David Hopper. Published December 1977, 24 pages, IDRC-100e.

The full text of a paper presented by the IDRC President at a symposium on Canada and world food. See p. 17 for more details.

Sharing Experience — DEVSIS: An Information Service for Decision-Makers. Published October 1977, 20 pages, IDRC-092e.

Lack of information very often means duplication of effort, waste of time, waste of money. DEVSIS is an information system designed to avoid such wastage. This illustrated booklet (also available in Spanish and French) explains the need for the system, its design, and its future.

Cassava as Animal Feed, Barry Nestel and Michael Graham, editors. Published November 1977, 147 pages, IDRC-095e.

This is a report of a workshop held at the University of Guelph, on 18-20 April 1977, jointly sponsored by the University and the IDRC. It includes 14 papers on the use of cassava-based feeds, a summary of conclusions, together with a bibliography and list of participants. This is the 13th book on cassava research published by the Centre.

Nutritional Standards and Methods of Evaluation for Food Legume Breeders, by J.H. Hulse, K.O. Rachie, and L.W. Billingsley. Published October 1977, 100 pages, IDRC-TS7e.

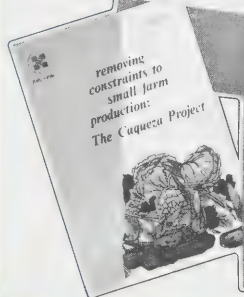
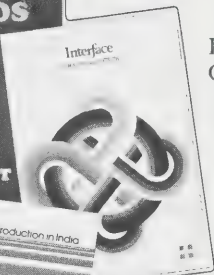
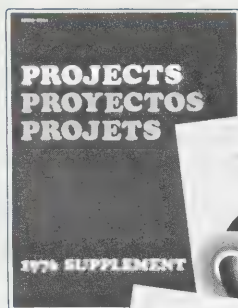
This technical study contains the recommendations of an international working group established in 1976 to propose standards of nutritional quality to be aimed for by legume breeders, and to prescribe the methods of physical and chemical analysis and biological evaluation relevant to the proposed standards. IDRC was one of the international bodies sponsoring the working group.

For details of how to obtain copies of these and other IDRC publications, see advertisement on the back cover of this issue.

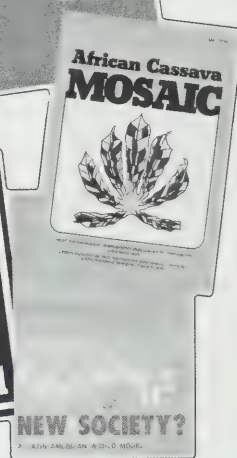
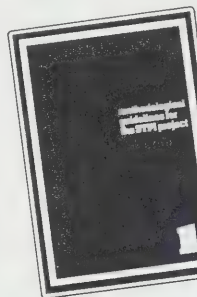
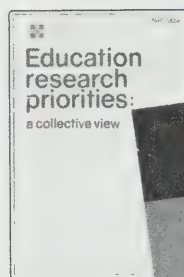
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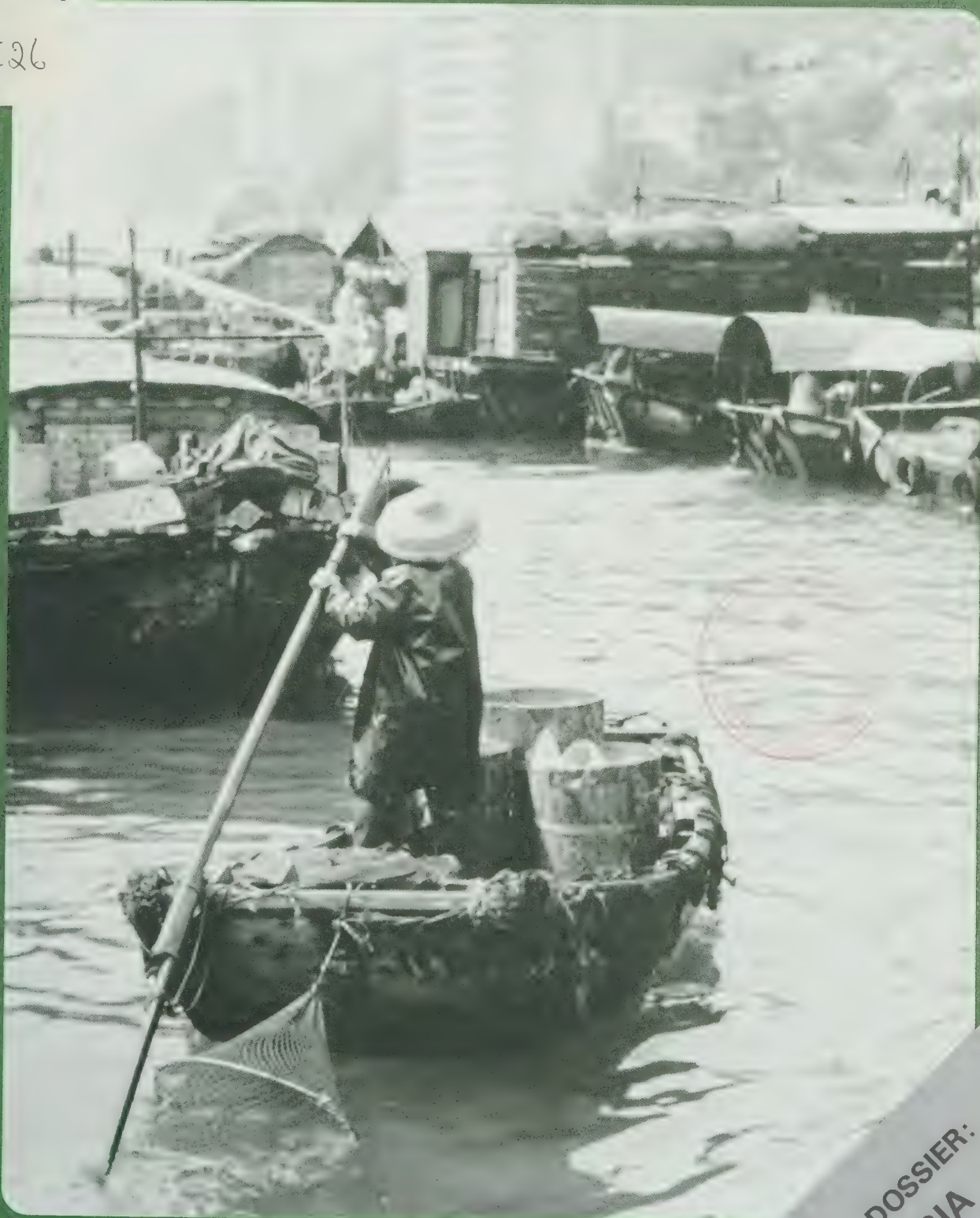
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Contents

3 New beginnings for an ancient crop

Quinoa, once cultivated by the Incas, may be the answer to Latin America's food grain shortage, reports Ed Weber.

6 Cassava — solving the toxicity puzzle

Alexander Dorozynski unravels some vital detective work by medical researchers in Africa.

8 The tri-coloured strip and other health instruments

Stella Feferbaum in Colombia discovers that medical equipment need be neither expensive nor complicated.

11 Dossier: Asia

Compiled with the assistance of IDRC's Asia Regional Office staff, this is the first of a planned series of *Reports* dossiers to present a cross-section of IDRC-supported research projects within a specific region.

21 New film aims to reduce grain losses

Report on the making of a film to educate Kenya's farmers, by Bob Stanley.

22 In search of a better banana

The small banana growers of Latin America hope to improve their livelihood and their product, reports Michael Graham.

24 Briefs

People, projects, events.

25 Commentary

Developing countries should be the world's big food producers, says former IDRC President David Hopper.

27 Centre's new President

The Canadian Government announced the appointment of IDRC's new President shortly before *Reports* was printed: a brief introduction.

27 New publications.

New beginnings for an ancient crop

E.J. Weber

The empire of the Incas was once the proud centre of an advanced civilization and highly organized system of agriculture. But the Incas have long since passed into distant history, and today's inhabitants of the High Andes are for the most part poor subsistence farmers, who must work long and hard to provide a bare living for themselves and their families.

The descendants of the Incas did not forget all their traditions, however, and today researchers in a number of Latin American countries are turning their attention to one of the crops first cultivated by those ancient peoples. The crop is called quinoa; it is known to be one of the most nutritious of grains; and the researchers hope it may be the answer to the Andean region's acute shortage of locally-produced food protein.

Suddenly, after centuries of neglect, there is a surge of interest in quinoa. In Peru strong efforts are being made to increase quinoa production as a means of reducing costly wheat imports, and research has been carried out on industrializing quinoa grain processing. In Bolivia the government has gone so far as to pass a law requiring the use of at least five percent of quinoa flour in commercially produced breads, pastas and the like. In Chile quinoa is being used in feeding programs to improve the nutrition of poor children.

All this enthusiasm merits a closer

examination. *Chenopodium quinoa Willd.*, to give the plant its full name, is an ancient crop originating in the Andes. Along with the potato it is known to be one of the earliest cultivated crops in the region. It was grown by various indian peoples long before the arrival of the Europeans, and has remained a staple of the peoples of the high Andes despite attempts to introduce European species.

Quinoa is a member of the *Chenopodium* or goose foot family, of which some 60 species are found around the world. Archaeological remains in Europe show that chenopods were also used as grain there, and various forms of the species are still grown today in hilly areas of northwest India. Nowhere, however, did the species become an important crop except in the Andean region — probably because equally good or better cereal grass plants were available.

It is generally accepted that quinoa evolved and was domesticated from wild ancestors by different groups in highland areas of Bolivia, Colombia, and Peru. It is a hardy plant, and provided a nutritious grain to supplement a diet consisting mainly of starchy tubers in regions where there were no adaptable wild grasses from which to create cereal grains.

Unlike potatoes and maize, however, quinoa was ignored by the Spaniards, and this neglect has continued until very recently. In 1965 there were the first stirrings of a renewed interest in the crop

Some of the many shapes, sizes and colours of quinoa grain are displayed in these samples from the collection at Patacamaya Research Station in Bolivia.





Quinoa in a farmer's field — ready to harvest.

on the part of a number of researchers in Bolivia and Peru. This led to the development of improved varieties and a better knowledge of the major characteristics of the plant itself, its cultivation and major constraints.

Quinoa is normally sown at altitudes of from 2,500 to 4,000 metres, and most varieties are resistant to frost. It will also yield harvests on poor soils and with an annual rainfall as low as 300 to 400mm. A number of diseases and pests affect the plant, especially mildew and leaf spot, but the most serious economic threat comes from birds, which attack when the crop is about to ripen.

Yields can vary enormously according to growing conditions — they may be as low as 450 kilograms per hectare or as high as 2,000 — but the average on the altiplano is about 800 to 1,000 kg/ha. A record yield of 5,000 kg/ha has been reported under ideal conditions near Lake Titicaca (thought by many to be the original "home" of quinoa) using the new variety *Sajama* developed in Bolivia.

Quinoa is often cultivated in rotation with other crops by highland farmers, some of whom place an almost religious significance on these cropping patterns, and believe quinoa can prevent disease among other crops. It is also used as a medicine for a variety of ailments, and is believed in some areas to improve the skin and to increase milk production in nursing mothers.

Such claims have yet to be proved, but there is certainly no doubt about quinoa's superiority to most other cereal grains in terms of protein content. This superiority is due principally to the quality of its protein, since it has a good balance of the essential body-building amino acids, especially Lysine (six percent). Protein content averages about 14 percent, although some studies have reported as high as 20 percent and others as low as 12 percent. In addition quinoa contains necessary vitamins such as vitamin C and the B complex of thiamine, riboflavin and niacin.

Tests with rats have shown that quinoa can considerably improve the nutritive value of cereal-based diets. Wheat flour mixed with quinoa flour at a ratio of 4:1 improved the nitrogen efficiency for growth by 40 percent, weight gain by 11 percent, and protein efficiency ratio by 72 percent over wheat flour alone.

In poultry feeding trials reported in Bolivia, chicks fed a ration containing cooked quinoa made gains equal to those receiving corn and skim milk. Rations containing uncooked quinoa, however, depressed the growth rate of both chicks and swine.

The reason for this drastic change in growth patterns is the presence of bitter-tasting saponins, glucosides which are found in the seedcoat of quinoa, and which have a toxic and/or growth-depressing effect on animals.

Saponins can be removed from the grain by repeated thorough washing, a

process which is shortened if lime is added to the water. Cooking also helps to remove both the bitter taste and the toxic effects. In Peru machines have been developed for large-scale processing of quinoa in industrial use, such as the preparation of wheat-quinoa flour mixes.

The other alternative is the development of saponin-free varieties, such as the Bolivian variety *Sajama*, which is practically free of saponins, although it still has a slightly bitter taste. Unfortunately it appears that most of the large-grained varieties now in use have a relatively high saponin content.

The utilisation and preparation of quinoa as a food is quite varied. The main uses are in soups and sweets, and a coarse bread called *kispina*. Various drinks are also prepared, hot or fermented. High protein cookies and biscuits can be produced by mixing up to 60 percent quinoa flour with wheat flour. The nutritive value of noodles can also be considerably increased by using up to 40 percent quinoa flour without affecting appearance or other characteristics of the end product. Quinoa flakes have also been tried, but these still retain a slightly bitter taste.

The leaves of the plant can also be eaten in salads or cooked, and in certain regions where vegetables are scarce this is a product of local importance. The leaves and stalks are also fed to ruminants, and the chaff and gleanings from threshing are generally fed to pigs.

Serious research into the improvement of quinoa began in 1965 at the Patacamaya Research Station in Bolivia, with the support of Oxfam and the UN Food and Agricultural Organization. The station now has a collection of some 700 different ecotypes taken mainly from farmers' fields, a further collection in Puno, Peru, contains some 600 entries, and additional collections are being undertaken. Analysis of these collections is enabling researchers to evaluate the genetic diversity of quinoa, and to select cultivars with desirable characteristics for improved varieties.

The first international convention on chenopods was held at Puno in 1968, attended by a small group of researchers, mainly from Bolivia and Peru. There was a much larger attendance, and a broader representation, at the second international convention, held in Bolivia in 1975, and a far wider range of topics was discussed.

Quinoa research still has a long way to go, however, and a new impetus was given to the work in 1977 when the IDRC agreed to support an expanded research program based at the Patacamaya Station at the Bolivian Institute of Agricultural Technology. The program has several aims: first to develop new quinoa varieties adapted to different agro-ecological production zones both in Bolivia and in surrounding countries; to develop economic production "packages" for introduction to



Part of the germ plasm collection at Condoriri, the experimental farm of the University of Oruro on the Bolivian altiplano. This particular crop did not do well.



Panicles of six different quinoa ecotypes, showing again the wide variety in seed-coat colour, shape, size, and branching.

farmers; and to provide training for Bolivian researchers in order to increase the number of scientists familiar with and capable of working intensively with quinoa.

The project is of particular importance in Bolivia, where production is at present insufficient to meet the demands created by the law requiring the addition of five percent of quinoa flour to commercially-produced baked goods. Further research has been underway at the University of Puno in Peru since 1976, supported by the Simon Bolivar Fund, and administered by the Inter-American Institute for the Agricultural Sciences (IICA).

All this is just a start. Much of the current research is still isolated and sporadic, and could benefit from better integration and an interdisciplinary approach. More work is needed in areas such as the development of varieties low in saponins, the removal of saponins

from the grain, and the possible industrial uses of the grain.

In an effort to promote better exchange of current information, a group of researchers is preparing a book on quinoa, to be published by IICA, which will pull together in one document as much of the relevant current knowledge as possible.

A great deal remains to be done, but it now seems certain that the persistence of those early researchers has finally paid off. In the near future, the grain that was once a major foodstuff for a mighty empire may once again become an important economic and nutritional mainstay in the food economy of the Andean region. □

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CASSAVA

Solving the toxicity puzzle

Alexander Dorozynski

The root crop cassava is the major source of carbohydrates for some 300 million people in tropical regions. With a total production of about 100 million tons, it is the world's seventh most important crop, after the principal cereal grains, potatoes and sweet potatoes. Production is constantly increasing, and is expected to double in 30 years or so.

This background underlines the importance of the findings reported by a team of Belgian physicians, who have demonstrated after several years of research that under certain circumstances the consumption of cassava can provoke goiter, cretinism, and mental retardation. Cassava contains a substance which, once ingested, inhibits iodine uptake by the thyroid gland. In regions where food contains only marginal amounts of iodine, there is a risk that cassava will trigger thyroid insufficiency that could have severe consequences on the development and the functioning of the nervous system.

The survey that led to this finding started nearly 10 years ago on Idjwi Island, situated in Lake Kivu, Zaire, and inhabited by some 30,000 people scattered throughout 69 villages.

It showed that there was a severe and uniform shortage of iodine throughout the island. So the researchers were surprised by their first, then unexplained, finding: in certain villages, particularly in the south, there were hardly any cases of goiter; in others, mostly in the northern part of the island, the condition was endemic, with more than half the population affected by goiter, cretinism, or mental retardation.

A team of researchers from the Saint Pierre Hospital, Brussels, working with Zairian physicians from the Zaire Scientific Research Institute, set out to solve this mystery. A first study of iodine uptake by the thyroid gland and of iodine excretion in urine was carried out on more than 600 men, women, and children in different villages. The results showed there was no significant difference between endemic areas, and goiter-free ones. Some factor other than iodine shortage had to be involved.

Another survey, based on geological data, was undertaken. It was known that the soil in the endemic areas was of a different composition than the soil in goiter-free areas, and the

researchers speculated that these differences might be reflected in the composition of plants grown and eaten by the islanders. This lead, however, also turned out to be disappointing: the soil composition had no detectable effect on goiter.

The researchers then undertook a detailed study of food crops grown on the island: bananas, sweet potatoes, groundnuts, cassava, pumpkins... The goal here was to find out whether the ingestion of one plant or another could affect iodine uptake by the thyroid.

It was then that cassava appeared as the number-one suspect. People whose diet included large amounts of cassava were found to absorb via the thyroid gland an amount of iodine well under the normal. Analyses of urine and serum samples also revealed that the islanders who regularly ate cassava had a high level of thiocyanate, an anti-thyroid substance associated with the consumption of certain vegetables. Cassava is one of them: it contains cyanogenic glucosides which are transformed by hydrolysis into toxic cyanides. After ingestion, these cyanides are rapidly detoxified, and give rise to thiocyanate. Experiences with rats confirmed this anti-thyroid effect and showed, more precisely, that the uptake of radioactive iodine by this gland was inversely proportional to the concentration of thiocyanate in the blood.

The prime function of the thyroid gland is to secrete hormones that regulate tissue oxydation processes. Iodine is an essential constituent of these hormones. Thyroid activity is thus dependent on the amount of iodine in our food. Normally, the absorption of 100 micrograms of iodine a day is sufficient to ensure adequate thyroid function.

If there is a shortage of iodine, or if iodine uptake is inhibited, the thyroid gland is stimulated by a regulatory process in which a pituitary hormone secreted by a gland located at the base of the brain plays a key role. It is the thyroid stimulating hormone (TSH) that "instructs" the thyroid to resume normal function but, in the absence of iodine, provokes an increase in volume of the thyroid, that is, a goiter. This hypertrophy does not necessarily represent a sufficient adaptation to prevent thyroid hormone shortage. The patient suffers from thyroid insufficiency; he lacks hormones to regulate certain metabolic processes, notably those that concern the central nervous system. When this insufficiency occurs during the first months of life it can disturb the maturation and development of the nervous system.

In the worst cases the result is extreme mental retardation and impairment of psychomotor development. The patient may be unable to walk, even to stand. Paralysis, particularly of the legs, and deafness can be so severe that some of them lead an almost vegetative life.

If iodine shortage occurs only after the first month of life, the thyroid may have accumulated sufficient iodine to function almost normally. There are no signs of thyroid insufficiency, but it is possible nevertheless that mental development is retarded. The patient, although he has neither the visible signs nor other symptoms of goiter, will not have attained his full intellectual capacities.

It could also happen, say the researchers, that an anomaly of the central nervous system is caused during gestation by thyroid dysfunction before birth. This hypothesis is supported by the observation that when an expecting mother in an endemic region receives iodine, her child will not be affected by either goiter or cretinism. Thus, in several countries, the utilization of iodized salt has made it possible to eliminate these diseases; but in others, the problem remains — notably in parts of Central Africa, where salt is hardly ever used in cooking, and where cassava is a staple food.

In addition, it is particularly impossible to evaluate the incidence of the less severe forms of mental retardation; these could lower the level of intelligence of an individual, and, on the scale of an entire population, become a major obstacle to development. In the past ten years or so, epidemiological studies in rural regions of Africa, South America and Asia, have revealed that endemic goiter is much more widespread than had been believed. It is estimated today that some 200 million people throughout the world are affected by this disease to varying degrees.



Photo: Neill McKee

Above: mother and child in Mali — the child may also suffer an abnormal thyroid condition in later years. Below: goiter is endemic in parts of Zaire — this young boy already shows signs of thyroid enlargement.



The risk of provoked hypothyroidism is not limited to tropical countries, as other vegetables also contain cyanogenic glucosides. The most frequently encountered are amygdalin in bitter almonds and the pit of some fruits, dhurrine in sorghum, and linamarin in cassava and other plants including *brassicaceae*, of which cabbage is a member.

There are several regions in Europe where the amount of iodine in food is barely sufficient, and where cabbage is consumed in large amounts. This is the case in certain parts of central Europe, and regions bordering the Mediterranean. Last year Dr François Delange, one of the Belgian research team, in collaboration with Sicilian physicians, carried out a study showing that a high level of thiocyanate — and of goiter — exists on some parts of Sicily.

What can be done to prevent these diseases?

It is known that mental retardation and other sequels of congenital hypothyroidism can be avoided if iodine treatment is started early, during the first days of life. However, it is almost impossible to make the diagnosis of thyroid insufficiency at birth on the basis of clinical signs.

Dr. Delange, together with Dr Claude Thilly, another member of the Belgian team, recently perfected a technique that determines the level of the pituitary hormone TSH from a single drop of dried blood. The level of this hormone increases when thyroid function is insufficient and the test thus allows the diagnosis of thyroid insufficiency in newborn infants.

Last year the Belgian researchers undertook another study, in the region of Ubangi in the north-eastern part of Zaire, where goiter is endemic in a population of about one million. They have found that goiter affects 60 to 70 percent of the population, and that up to ten percent of the inhabitants (depending on the location of the villages, on nutrition, and socio-economic conditions) suffer from cretinism. In the Ubangi region, as on Idjwi Island, the consumption of cassava is associated with a high level of thiocyanate and a decreased iodine uptake.

A vast campaign is now being undertaken to eradicate goiter and cretinism in this highly endemic region. Treatment consists of intramuscular injections of iodine in an oily solution that is resorbed slowly, and diffuses the iodine throughout the organism, over a period of three to seven years. Some 300,000 injections have already been given, and 700,000 more are scheduled. This long-term project is supported by the Belgian General Administration of Cooperation and Development, the Ministry of Science Policy, and the Medical Fund for Scientific Research.

The IDRC, which has supported research into cassava toxicity in the region since 1974, is now funding a second phase of this research. The aim is to define precisely the nutritional conditions required in man to induce goiter and cretinism, and to study the mechanism responsible for mental retardation resulting from a cassava-based diet. This will include specifically the role of thyroid failure in early life, and the direct toxic effect of cyanide on the central nervous system.

The potential impact of these findings and of the diagnosis and treatment campaigns is evident. At stake are not only the state of health of vast populations, but the intellectual capabilities of men and women carrying the heavy burden of endemic mental retardation, as they strive to overcome the difficult conditions of their lives.

If the goitrogenic effect of cassava, demonstrated in Zaire, is confirmed in other tropical regions, new avenues of research must be explored aside from the agricultural efforts aimed at increasing productivity: research in medical prevention, treatment of cassava before it is eaten, and development of cassava lines that cannot trigger thyroid insufficiency. □

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The tri-coloured strip

and other health instruments

Stella Feferbaum



Photos: Jaime Rojas

A health auxiliary and her young patient with the micro health post, one of the aids developed by CIMDER for its rural health workers.

IN an effort to bring basic health care to all their people, many countries have recently begun recruiting and training auxiliary health workers — often with considerable success. One problem common to most such programs, however, is how to provide their workers with the tools they need to make them truly effective.

The health auxiliary must be mobile, able to move from house to house, from village to village, usually on foot. So any equipment must be light and portable, yet comprehensive enough to enable them to bring a wide range of medical services to the people they serve.

A leader in this field is CIMDER, the Rural Development Multidisciplinary Research Centre, in Cali, Colombia, which has developed a number of simple health instruments as aids to its auxiliaries. CIMDER's workers are young women, all selected by the communities in which they will eventually serve. Each receives 14 weeks training before being assigned to the health care of some 150 families — about 1,000 patients.

Equipped with her health kit and her knowledge of the local people, the health worker is better able to gain the confidence of the community and bring about changes in health habits.

First among the health worker's instruments is a plastic-coated tri-coloured cardboard strip just 30 centimetres long and 15 millimetres wide. With this simple tool she can determine the nutritional condition of children from infancy up to 6 years — the most vulnerable years of childhood.

The strip is adapted from a similar instrument first tested in Africa. It is used to measure the brachial perimeter (the circumference of the upper arm), which provides a reliable indication of whether the child is *well-nourished*, in *danger of malnutrition*, or *malnourished*. These three conditions are indicated on the strip by coloured bands — green, yellow and red.

Members of the CIMDER health team became interested in the work done on the strip in Africa and decided to test its adaptability to Colombia. Strangely enough, tests with two different groups of children showed that there was only a 35 percent correlation between the Shakir-Morley scale used in Africa and the traditional Ramos-Galvan age-weight scale.

The CIMDER team began working to improve the instrument's precision and reliability. A short piece of string had been used in the African experiment, but the originators recognized the problem of its stretching or shrinking, and recommended the use of strips of X-ray film. Also, the age range of the children had to be reduced because one strip alone could not cover the first six years, during which the child goes through very different periods of growth. The use of one strip for each year seemed somewhat complicated, however, so it was decided to compute the scales in such a way as to make it possible to have just two strips, employing both sides and both edges of each strip so that it could be used to make four different measurements. An individual strip was adopted for the first-year age group because in this stage of development the differences, however small, are crucial. The second strip was designed to measure children from 12 months up to six years.

The key to this wide range of measurement is the positioning of the yellow band (which is a warning signal of malnutrition) on a slant to give different readings on each edge. One end of the strip is passed through a slot at point zero to form an adjustable loop that will always give an accurate reading. Each strip costs about three pesos (less than 12 cents).

Cost aside, the strip is simplicity itself when compared to the use of weighing scales or a tape measure. It is easy for the health worker or the mother to handle, it requires no knowledge or reading or the ability to work out tables of weights and measures, and it is always on hand. Once the colour system is explained it is an easily read code permitting a child's health to be monitored constantly. A comparison of a community evaluation done with the strip and with other methods showed only a seven percent difference, which is not considered a significant variation.

Perhaps the most important thing about the strip as it is used in the CIMDER health program is the effect it has had on the community. It is part of CIMDER's approach to have solutions to community problems come from the community itself. After the use of the strip was explained to the first group of parents, they were asked to take it home and make the measurements. When they returned, most of them indicated that their children had been "in the red", thus avoiding the term malnourished.

This personal and immediate confrontation alarmed the parents, who then

proceeded to analyze the cause of the situation with the health worker. So they discovered for themselves that their children were "in the red" due to poor nutrition, parasites, impure water, lack of vaccinations, and other related reasons.

The next step was to find lasting solutions to the problem, such as programs on health, water purification, nutrition, deparasitation, and vaccination. These programs were planned and carried out by a community that had become aware of its problems.

The health worker covers her assigned area making the strip measurements every two months, increasing her visits when danger signs appear. As a result, mothers have become interested in belonging to Family Health Units (FHUS) — groups of around 20 families whose purpose is to improve the general health level by means of programs which they plan and implement themselves with the support of the health worker. The role of the mothers in these groups is especially important.

CIMDER has developed other health instruments to support the health workers and the FHUS. Each unit receives a "micro health post" — a compact wooden box containing the necessary equipment to provide basic health services: first-aid for minor injuries, poisoning, burns, fractures, and dislocations, enemas, and drugs for treatment of the most common diseases in the rural areas. With it the health worker can efficiently handle 60 percent of her patients' health problems unassisted.

The micro post also has a small compartment where the voluntary contributions paid by the patients are kept. This money is used for the upkeep of the post.

The water problem in rural areas is serious. Wells are usually shallow, and the water contaminated. Boiling the water is costly, time-consuming, and not always effective. A simple method of purifying water was needed, so CIMDER's health team designed a simplified well chlorinator. The instrument can be made at home and costs less than three pesos a month in use.

It is simply a plastic container in which a small bag of well-mixed sand and calcium hypochlorite (chlorine) is placed. When lowered into the well, small holes in the bag allow the chlorine to diffuse through the water, purifying it. The mixture remains effective for one month, after which it must be replaced.

An experimental analysis showed that after using the concentration of chlorine recommended by the WHO, the bacteria remaining in the water were not pathologically significant, and the process had not removed salts, iron, or magnesium from the water. In other words, the water was suitable for human consumption.

The health worker is also equipped with a "mini laboratory". Through simple urine and blood analyses done with reactive papers she can detect problems



Measurement of the upper arm with the tri-colored strip will show if the child is in danger of malnourishment.



A home made chlorinator is lowered into the village well — it will keep the water pure for a month at a time.



The master health file contains records of all the auxiliary's patients — colour coded for easy reference.



Health auxiliary reviews the manual with one of "her" families — with this book the people can manage on their own.

which, if referred to a physician in time, will help reduce the risk of greater complications. Over a two-month period, for example, health workers referred six cases of probable urinary infection which were later confirmed and treated by physicians. With a simple prick of the finger, the presence of glucose or blood ureic nitrogen can also be quickly detected. And all these tests can be done quickly and efficiently in the individual's own home.

Then there is the "master box". It contains file cards showing each patient's medical history. This simple information system is kept by the health worker, and enables her to establish 23 basic health indicators for each individual. It also eliminates the need for costly clinical surveys because it offers all the data required to obtain a complete health profile of the community.

Different items are marked with different colours so the health worker can see at a glance the number of children in her area who have not been vaccinated, the number of chlorinators that have been installed, or the number of malnourished children. The health worker does not use a medical bag (which is regarded as an object of scorn in some areas), instead she carries a typical open purse in which the cards of the families to be visited that day are placed. The information in the box may also act as a source of stimulation for FHU action, and is invaluable to the health worker for case follow-up.

One example of the system's effectiveness: in one of the program areas a researcher was surprised to find no parasites in 30 percent of the fecal matter samples he examined (there is an 88 percent prevalence of parasitism in the rural areas of Colombia), and assumed that an error had been made. Coincidentally it was discovered that the health worker for the area had given deparasitation treatment to exactly 30 percent of the population a few days earlier. This work, recorded on her health cards, verified the examination results.

The author's dedication in the CIMDER Rural Family's Medical Manual reads "With gratitude and respect, to the people of Micabaquia from whom we learned more than we taught".

This little book, which has become the cornerstone of the CIMDER health program was created in conjunction with the rural people through discussions in which the answers to many of the problems in the region were found — discussions like those that took place with the first group of parents to use the tri-coloured strip, which are included in the chapter on rural child health care.

The manual also contains chapters on the care of the sick at home, treatment of common diseases, and emergency first-aid. Using simple language, drawings, and a question-and-answer format, the manual gives step-by-step explanations of what should be done in each case.

The purpose of the manual is twofold: to serve as a primer for the health worker, and to be used by her to train the family leaders in the FHUs. The day the manual was first introduced in an FHU meeting it was realized that several of the members could not read. When the group was asked what to do about this problem one woman suggested that those who could not read should sit next to someone who could, listen to what was read out loud, and then everyone would repeat the instructions together. This method proved so effective that one of the non-readers in fact came out top in the evaluation examination that followed.

The creation of suitable instruments that the health worker can easily handle has helped to extend the workers' scope of action to even greater numbers of people. In three years the CIMDER program has made so much progress that it has become a model for the rest of Latin America.

The measurement of children's nutritional condition using that simple tri-coloured strip set off a series of lasting reactions. Parents have discovered that they can grow food that improves both the family diet and income. Many families now have their own kitchen gardens, have made sanitary latrines, and regularly purify their water. Convinced of the effectiveness of the measures, parents have become aware of the need for regular vaccinations, parasite treatments, and in general a whole series of steps which, because they discovered them for themselves, are far more effective than crash health campaigns that disappear as quickly as they came.

When members of one FHU were asked recently what they would do when the CIMDER program was over, the answer was quite clear: "We'll be sorry to see them go, but I think we can manage by ourselves now." □

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Nobody owes us a living

"The crux of our problem as I see it, is how are we to increase our respective national incomes, and while so doing how are we to win the race against the increase in population... Our first task is to help ourselves. We must as far as possible, by our own efforts, develop our economies to secure the maximum benefits for our people from our own resources and by our own efforts..."

*President J.R. Jayewardene of Sri Lanka,
at an UNCTAD meeting in 1967.*

The themes of self-reliance and national resilience run steadily through the pronouncements of many Asian leaders as they approach the prospects, processes, and problems of development. "Nobody owes us a living," a phrase first uttered as a national admonition by Prime Minister Lee Kuan Yew of Singapore, has become something of a slogan in Asia, where the need to look inwards for the strength that sustains a people as they move towards well-being is often emphasized. As Finance Minister Ronnie de Mel of Sri Lanka put it recently: "As much as a beggar will not advance in private life, a nation that begs will also not develop... Only a nation which relies on its own efforts will succeed in the long run."

There is no *mantram* or magic incantation that enables a nation to reach the goal of self-reliance. Development requires a blend of strategies, techniques, and resources. There is no such thing as the "correct" blend; each country has to make its own. Discovering, unleashing, and fostering a nation's creative energies is a process that lies within the aims of the International Development Research Centre.

Asia, a region reasonably well-endowed with human resources, has a long-established tradition of learning and scientific inquiry. Thirty years ago, for example, J.R. Jayewardene, now President of Sri Lanka, then his country's Finance Minister, told an audience of modern scientists that "the whole process of the scientific method, where knowledge gained through the senses is verified by exact observation, corresponds to the Buddhist term *gnana*." China's Confucian system of education enforced a three-tiered system of study and examination, not dissimilar to arrangements introduced later in West Europe. Physicians in Asia used *ekaveriya* (*rauwolfia serpentina*) to treat hypertension many, many years before the drug became a part of modern pharmacology. Technology, the

handmaiden of science, was not unknown in ancient Asia, either. Irrigation tanks, phased cropping, terraced cultivation on hillsides, drainage systems, and ornate temples — now, alas, not much more than attractions for fat-walleted tourists — betoken considerable expertise in such areas as agriculture, hydrology, geology, and construction engineering, long before the colonial era began.

Against such a background, it is not surprising that Asian institutions have responded energetically to the IDRC's offer of support for development research. The Centre has been described as "a granting agency channeling its main support to research workers in developing countries, to encourage and assist them to undertake investigations, and find solutions, to their own problems." Thus, the IDRC does not play the role of a *mahadanamutta* — an expert in omniscience — enforcing solutions on others, but responds to project proposals from developing countries, formulated in terms of their own priorities. So Asian researchers and research institutions must take as much credit as the IDRC for the fact that in the first six years of its operation the Centre spent 39 percent of its project funds in Asia. Some of the work supported by the IDRC in Asia is described in a series of articles in the rest of this Dossier.

The IDRC Reports first published a special Dossier in Vol.6 No.1, one year ago, when it focussed on population. Succeeding Dossiers have all been on specific development topics, and the Asia Dossier is the first that deals with a geographical region. Dossiers on other regions will be published in coming months.

The present Dossier, and others that follow, will show how new partners in development — developing country researchers and the IDRC — can help developing countries to help themselves.

The most diverse of continents

Jingjai Hanchanlash



Jingjai Hanchanlash, a native of Thailand, is Director of the IDRC's Asia Regional Office in Singapore.

When we talk about Asia, we are talking about the largest of the continents. It covers one-third of the land mass of our planet and contains two-thirds of the world's population. It is also the most diverse of all the continents.

The name "Asia" itself is more a geographical convenience than a description of a homogeneous land mass. Asia's population is unevenly distributed, ranging from 850 million or more in the People's Republic of China to 2.3 million in Singapore. If one includes "West Asia" in the region, it is the birthplace of all the great world religions, including Buddhism, Christianity, Hinduism, Islam, Judaism, and Taoism. It contains most of the physical varieties of modern man, and its geography and ecology are as varied as its people.

This lack of any geographic, ethnic, religious, or cultural homogeneity precludes any sweeping socio-economic or political generalizations. From the development point of view, however, Asian countries can be loosely classified according to per capita gross national product (GNP). At the top end of the scale are those countries with per capita GNP over \$2,000. At the other end are those with less than \$200. Unfortunately many countries are still to be found at the lower end of this economic scale.

In terms of development policy, the nations of Asia can generally be grouped into three styles. There is the free market industrial society style, with the economy geared to creating new needs for consumers. The obvious example is Japan. With its per capita GNP of \$4,460 the land of the rising sun now rivals many Western industrial countries.

At the other extreme is the socialist totalitarian style, where the state has control over all means of production. As in the People's Republic of China, the most apparent characteristic of this style is that politics and ideology are the guiding force. Work is performed as a duty to the community, and not merely for personal gain.

In between are those countries with a mixed development style. They range from countries like Thailand, with its emphasis on a liberal economy, to Sri Lanka where the thrust has been towards a welfare state.

Development policy in many Asian countries, especially in those with a mixed development style, was usually based on a Western model. In trying to follow Western patterns of development, however, policymakers in those countries have sometimes lost sight of the fact that each country should have its own pattern of development, based not only on economic requirements but also on social and cultural realities.

One country can learn from another, but need not necessarily imitate, even in the case of countries in the same region with similar development styles. No two countries are identical. For instance, Singapore sees highrise building as the solution to its housing problem. But in

Thailand, which has only a 13 percent urban population in contrast to Singapore's 100 percent, there is no need for such an intensive program of construction in the cities. Rather, the emphasis is on building an adequate infrastructure in the rural areas, to slow down the "rural exodus" to the cities. In-depth comparative studies in the region are therefore essential because they enable policymakers to decide what aspects of neighbouring experience can be usefully adapted, and what parts are unsuitable or impractical.

Politics, of course, has a large part to play in the style of any country's development policy. But whether the system of government is democratic or totalitarian, or any of the variations in between, there is so far no convincing evidence that any political system is inherently superior in its ability to accomplish fundamental socio-economic reforms.

This is not intended as a pessimistic comment on the development potential of Asian countries, it is merely meant to illustrate that there is no standard "political panacea" for the region. Each country has to find its own way. We can talk about the Thai experience or the Singaporean experience, but we certainly cannot talk about the "Asian experience" — although some problems, and some approaches, are common to the region as a whole.

In their search for political stability and economic prosperity, some Asian countries have in recent years given serious consideration to regional grouping. This is particularly true of Southeast Asia, which has seen almost two decades of experimentation with regionalism.

In 1961 the Association of Southeast Asia (ASA) was formed by Thailand, Philippines and Malaysia, with the aim of providing a mechanism for economic, socio-cultural, and technical cooperation and consultation among the three member countries. The suspension of diplomatic relations between the Philippines and Malaysia in 1963 over rival claims to Sabah, incapacitated ASA for a few years. To fill this vacuum the confederation of Malaysia, Philippines and Indonesia — Maphilindo — was formed in August 1963. Although Malaysia subsequently withdrew, the Philippines and Indonesia continued their association. With the improvement of Philippines-Malaysia relations, ASA foreign ministers met anew in Bangkok in 1966 and decided to strengthen and enlarge the Association.

The following year, foreign ministers of Thailand, Malaysia, Philippines, Indonesia, and Singapore met in Thailand to establish the Association of Southeast Asian Nations (ASEAN). In its early years ASEAN moved slowly, but in 1976 a serious effort was made to speed up the pace at the first ASEAN summit meeting in Bali. This effort was carried over to a

second summit meeting in Kuala Lumpur in August 1977.

While it is generally agreed that after 10 years of existence, ASEAN has succeeded in breaking down psychological barriers between its members, its record in the field of economic co-operation remains poor compared to the progress of organizations like the European Economic Community. But ASEAN cannot be judged solely against the performance of comparable groups. It was set up as one of many means to achieve political stability conducive to economic development in a region that has been plagued by discord and poverty; and threatened by foreign domination. Regular ministerial meetings and consultations within ASEAN have, to a certain degree, helped to bring about a sense of common identity, and improved bilateral relations within the Association. Only time can tell how successful ASEAN will be in the future, and whether it will serve as an example to the rest of Asia.

In any case, ASEAN or non-ASEAN, the over-riding problem in most countries of Asia is that of raising the level of rural life — not by “do-goodism” but by a real transformation of the rural economy.

While the per capita GNP in some Asian countries has increased significantly in the last decade, the living conditions of the farmers in those countries have scarcely improved, and have even deteriorated in some areas. In addition, the economic development of the urban sector has produced the aberration of community and cultural decay, increased crime rates, and the alienation of youth deprived of traditional values with no satisfactory substitute.

In such circumstances it is not surprising that people begin to question the validity, even the relevance, of the development goals based on foreign models. Without any concrete improvement in their living conditions they become more and more skeptical about the development policies of their own governments, and inevitably start to look for some better alternative. Political upheaval results, and that again slows down development.

For most of Asia, therefore, the most pressing need is that of the political will to devise structures that accelerate economic modernization without sacrificing socio-cultural values; and increase productivity while at the same time ensuring that the sharing of a nation's wealth is not lopsided. Perhaps, it would be wise to follow the wisdom of the Buddha, who said: “The duty of a ruler is to protect his people. He is the parent of his people and he protects them by his laws. . . Indeed, his ruling is not perfect until his people abide in peace. They are his country's treasure!” □

Learning by doing social science research

Jacques Amyot

IT has always been part of the IDRC philosophy that research projects can and should contribute to training, and that practical experience in doing research under competent supervision is one of the best ways to learn how to do research.

The “learning by doing” formula is used in different ways in different kinds of IDRC supported research projects. When the University of Papua New Guinea undertook a study of rural-urban migration patterns in 1974 there were no local social scientists available to direct the research. So expatriate staff of the University used students of local teachers' colleges as field staff to conduct interviews and administer questionnaires.

The experiment worked out very well. Besides providing obvious benefits to the research, this approach resulted in the training of a pool of experienced research assistants who can be applied to future research projects by university and by government. In all probability the most capable will be absorbed into government, given the demand for administrators, but their research experience should stand them in good stead in their government posts.

More usually in Asia however, the use of junior personnel in research projects is more directly related to their own career development in the social sciences. These may be students enrolled in an academic social science department working under the direction of teachers in whose research they are involved; or they are recent graduates at a junior level, perhaps still doing course work on a part-time basis towards a higher degree, who have accepted research positions in a research institute. Many of these will eventually move into senior positions as social science teachers and researchers.

A study of the food distribution systems of the Pacific Islands undertaken by the University of the South Pacific in Fiji, was used as a means to set up a program of graduate studies, which the University lacked. Although many students were employed as part-time enumerators, three college level graduates were selected for full-time involvement in a research and training program built around the research project. The program was fully integrated with the university program of instruction leading up to a formal degree.

Some research projects have training as their main emphasis, for example the Jakarta Social Research Training Program based in the Faculty of Social Sciences of the University of Indonesia. The keystone of the program is an Advisory Committee composed of Indonesian social scientists who determine policy, select the personnel and the trainees, and administer the program through a secretariat.

The program is an effort to meet the acute need to upgrade social science faculty in Indonesia. The Committee expects that the program will contribute to the identification of good Ph.D. candidates and in fact, scholarships for higher study are sought for the most promising graduates. Others return to their home institutions to resume their duties immediately on completion of their course.

In 1973, recognition that there was no mechanism available in Southeast Asia to stimulate and encourage more junior social scientists to undertake research projects in population and to develop their research skills led the IDRC and the Ford Foundation to jointly establish the Southeast Asia Population Research Awards Program (SEAPRAP).

Special efforts are made to attract young and relatively inexperienced researchers to the program, which is administered and coordinated by an Asian social scientist based in the IDRC Asia Regional Office in Singapore. Senior social scientists within the region serve as advisors to awardees, and a Program Committee of five senior Southeast Asian social scientists formulates policy, screens and selects applications for awards.

It is no accident then that one of the criteria for evaluation of research proposals received by the IDRC is their potential for training: does the project include junior researchers who will benefit from involvement with the project for their own professional development. □

Jacques Amyot is liaison officer for the Social Sciences and Human Resources Division of the IDRC in the Regional Office in Singapore.

Farmers are partners in research

Gordon Banta

An agronomist, an economist, and two farmers are standing in a rice field discussing what crop should be planted after the rice is harvested. The scene is typical of multiple cropping research today, as interdisciplinary research teams are moving out of research stations and into the farmers' fields to test and develop technology in the environment where it will be used.

The farmer thus becomes a partner in the research. Because he supplies the land and a major part of the labour, he may reject any idea that he feels will not help him.

The basic idea that separates cropping systems research from traditional agricultural research is that the farm is viewed as a total system. The emphasis is on crops, but the interactions with animal and household activities are taken into account — interactions that are impossible to duplicate on a research station. The goal is to make more efficient use of the farmer's total resources. This is usually achieved by growing additional crops, and by increasing the yield of existing crops.

In Southeast Asia over 80 percent of the farmers have less than three hectares of land. Rice is the predominant crop, and about 70 percent is grown under rainfed conditions, usually only one crop a year.

Northeast Thailand is a good example of a region where cropping systems research has potential. In a study of the region the Division of Agricultural Economics found that only 40 percent of agricultural labour was utilized in the wet season, while 13 percent of the fields were left unplanted.

In the current crop year peanuts, mungbean, maize and yard-long bean were grown successfully before rice. Then the rains failed, and several cooperator farmers lost most of their traditionally grown rice because they waited to puddle the land and transplant. By direct seeding, however, a second rice crop was produced after the first upland crop was harvested, this in a

region that had been declared a disaster area by the government of Thailand.

It is expected that with varieties more suited to the local soil and rainfall patterns, most of Northeast Thailand could produce two crops per year, with a few areas having longer duration rainfall producing three crops in a good year.

It is in the area of better varieties, management and other technology that cropping systems research can have a major impact. Researchers working in the farm environment are able to feed back to central research institutions specific problems. If no solution to the problem is known, the specialist then has a new research project which he knows will have immediate impact on the farmers' ability to increase their well being.

Since only a few farmers are directly involved in the research, neighbouring farmers are watched to see if they adopt a new cropping pattern, and if so what modifications they make to it. Once this stage is reached, a workable package is available for extension.

Cropping systems work started at IRRI (the International Rice Research Institute) in 1968, and has received continuous support from IDRC since 1970. Today IRRI's cropping systems work is so widely accepted that there is an Asian Cropping Systems Network, comprising Bangladesh, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka, and Thailand. People working directly in national programs meet every six months to compare results and discuss problems. Burma is also starting a program, and may join the network. South Korea, with its temperate climate, faces different problems, but nevertheless attends the meetings — research methodology can still be exchanged.

Each country in the network has a different set of problems, and the cropping systems programs at first seem quite different. In Indonesia one group is working on cropping patterns suited to new land in the transmigration areas. Sri Lanka has a team working on reviving rice production below the old tanks in the dry zone. Bangladesh is concerned with getting an extra crop in the deep water rice areas. Thailand is trying to get a second crop either before or after the rainfed rice crop on soils of very low fertility.

Each program is established by the national government to meet their specific needs and goals, yet in all these examples there is a common methodology which scientists share with other country programs. The Asian Cropping Systems Network is a good example of an Asian program, operated by Asians to solve Asian problems. □

Gordon Banta is a project adviser with the Centre's Agriculture, Food and Nutrition Sciences Division. He has worked on cropping systems research in IRRI since 1970, and is now based in Thailand.



A tree that grows very rapidly, provides nutritious forage for animals, and yields firewood, timber, and fertilizer abundantly seems scarcely less than miraculous. The tree is leucaena (also known as leadtree, ipil-ipil, and koa haole), and although scientists are not prone to endorsing miracles, they do regard the potential of this tropical leguminous tree as "promising".*

The IDRC is supporting the Philippine Council for Agriculture and Resources Research (PCARR) in a project to develop the economic potential of leucaena for small landholders in the tropics.

In the Philippines, leucaena plantations have annually produced more wood than any other species now known. The tree leucaena resprouts vigorously from stumps, and can be harvested again in five to six years. The wood properties make it suitable for pulp and paper, and the manufacture of rayon and cellophane. The wood is strong, dense, and attractive, and has machining properties comparable to hardwoods used for commercial lumber and plywood. For the rural smallholder, leucaena can provide a ready source of roundwood for fence posts, rafters and joists for small buildings, and props for climbing and hanging crops after only two years.

Because the tree grows rapidly, yields well and will survive many cuttings, it may be ideal for firewood plantations or woodlots. Over half of all timber cut in the world is used for cooking or heating, and demand is rapidly outstripping supplies of traditional woods. Leucaena has an uncommonly high density and calorific value — good burning properties — and should be able to provide a reliable energy source for cooking, heating, and small industry. It may also supply the rural smallholder with additional income and employment oppor-

*The US National Academy of Sciences has recently published *Leucaena: promising forage and tree crop for the tropics*, available from the Commission on International Relations (JH 215), NAS/NRC, 2101 Constitution Avenue, Washington DC 20418, USA.

R TREE?

Well, it's definitely promising . . .

Rowan Shirkie

tunities through the sale of wood and charcoal to urban areas.

Leucaena (pronounced loo-see-na) originated in Central America, and was spread to the Philippines and other countries in the western Pacific by Spanish traders several centuries ago. From the Pacific countries, the trees have spread throughout Southeast Asia and into Africa, until they are today found in almost all tropical countries. Two species are of most interest to scientists: a bushy shrub that averages about 5m at maturity, and a single-trunked tree species that matures in six years, reaching heights of up to 20m and diameter of 28cm.

Like most legumes, leucaena can form a mutually beneficial partnership with certain soil bacteria. The bacteria, known as *Rhizobium*, penetrate the young leucaena rootlets and multiply to create colonies in the form of nodules on the root surface. The bacteria absorb large amounts of nitrogen gas from the air in the soil and convert it to other nitrogen compounds that the plant can use for its own growth. Hence, leucaena requires little or no nitrogen fertilizer, and can thrive under soil conditions that would not sustain other crops. Its deep water-seeking tap root also gives the plant a measure of drought tolerance.

Besides "manufacturing" its own fertilizer, leucaena can provide essential nutrients for other plants as well. Many plants (and most trees) feed off the nutrients released in the soil by decaying vegetable material deposited there when other plants die or shed leaves. Deliberately adding plant matter to soils as fertilizer is called "green manuring". Leucaena is a rich green manure, providing nitrogen (its nitrogen contribution is especially high because of the *Rhizobium* activities), phosphorus, potassium, and calcium in significant amounts. As the increasing price and decreasing availability of petroleum-based fertilizers places them out of reach of small farmers, the value and use of leucaena as a renewable source of fertilizer will gain importance.

Researchers at PCARR, working in cooperation with the Forest Research Institute of the University of the Philippines, Los Baños, are studying the effects of leucaena green manure in experiments combining it with rows of sweet corn and rice. As a check, they will also use only chemical nitrogen fertilizer on a crop of the same size. An analysis of yields will give an indication of the comparative efficiency and economy of organic leucaena and commercial fertilizers.

Young leucaena is a forage that provides a valuable source of crude protein, vitamins and minerals for grazing animals. Yields of edible dry matter (leaves, flowers, pods, buds, and fine twigs) compare well with the best of conventional forage legumes such as alfalfa, but because of its nutritive and vigorous growth, leucaena can support more livestock on less land, and still produce high liveweight gains in meat animals and maintain good milk production in dairy animals.

In recent years some new varieties have been developed in Australia and Hawaii. Under favourable conditions these giant "super trees" have been known to produce annual yields of up to 24 tons per hectare. In Hawaii it has been shown that one hectare of leucaena interplanted with guinea grass can support at least three cattle. This is of particular importance to the Philippines, where 85 percent of the cattle are raised in twos and threes on small holdings. A great deal more research is needed, however, before the tree's full commercial potential can be realized.

One of the limitations of leucaena is that its foliage contains a toxic amino acid — mimosine — that can cause goitre and hair loss in animals fed high proportions of this forage over extended periods. However, simple management techniques to ensure a balanced diet, and research to develop strains of leucaena low in mimosine should eliminate this problem in future.

The PCARR project is aimed at overcoming some of leucaena's limitations,

as well as exploiting its advantages. The tree has been limited previously because it grows best only in lowland areas below about 500m, and its exceptional yields occur only in fertile, well-drained soils where rainfall or irrigation is adequate. Like other legumes, leucaena requires a reasonable mineral balance in the soils on which it grows, but not enough is yet known about its requirements for sustained development. Seedlings grow slowly at first, leaving the tree vulnerable to adverse climatic conditions, weeds, and overgrazing. This period of vulnerability may make the tree crop somewhat difficult to establish. But once established, if it is not properly managed leucaena can become a nuisance, growing in dense and rank tangles.

Well aware of these limitations, the PCARR research team will attempt to develop their own improved strains of leucaena. They will collect a range of leucaena species, including some still growing wild in Central America. This genetic material will be used in a selection program aimed at identifying new strains with desirable characteristics such as low mimosine content, ability to adapt and grow well in a broader range of climatic and agronomic conditions, and rapid seedling growth. The research will also determine the plant's nutritional needs and its tolerance of adverse soil conditions, as well as developing new seeding and planting techniques to improve survival rates.

Gathering this detailed and specific knowledge about leucaena is a major step towards fulfilling the tree's promising potential. And the ultimate beneficiaries will be the small farmers of the region, who have long recognized the plant's usefulness: for them the "super tree" could bring a much needed increase in income, a steady source of fuel and fodder, and improved food production. □

Rowan Shirkie is an editorial assistant with the Centre's Publications Division in Ottawa.

TECHNONET

Making self-reliance more than a slogan

Leon V. Chico

A major concern of many developing countries in Asia faced with problems of unemployment and income disparities between urban and rural areas is the promotion and development of small industries in the countryside. But as small industries flourish, many problems surface that are traceable to technical or technological aspects.

The kind of problem encountered in small-scale industries in many countries in Asia does not yield to "book" solutions — solutions that have often been inspired by experiences and successes in more developed economies. Small industries often fail because of excessive costs, particularly as a result of wastage or improper use of raw materials, or because their products are of low quality brought about by poor methods of production. To overcome these problems industry needs technological advice. Quite often, the advice needed is very basic — it is not a question of providing advanced technology, but of having an experienced engineer or technician look at a plant and then make suggestions to improve the processes or the products. Unfortunately, many of these small industries cannot afford to pay for such services in their earlier stages of development.

These services — called industrial extension — vary widely from one country to another. There is, however, recognition of the need to provide technological advice on equipment, methods, processes, production techniques and quality control; coupled with a determination to have the personnel and resources to provide this advice

to production managers on the factory floor.

Because of wide differences in language, cultural background, types of industry and levels of industrial development, it is clear that the industrial extension services must be staffed by indigenous engineers or technicians, and be complementary to the fields of management, marketing and financing which are equally important. These should be organized nationally or perhaps even by provinces and cities. No service organized for the region as a whole could be expected to provide satisfactory service to the individual factories. But a regional service could provide resources on which the various national extension services could draw; the regional service could also provide a focus that would facilitate cooperation and exchanges between the national extension services and their linking into a functional network.

This was the premise upon which a major project in Asia was conceived. In 1973 the IDRC agreed to support a project named TECHNONET ASIA. It brought together eight organizations in six Asian countries into a network for industrial technology information and extension services, and has since expanded to include eleven organizations in nine countries.

The participating organizations had two common features: they were all involved in rendering assistance to small and medium industries in their respective countries; and they were all concerned with the technical and technological aspects of industrialization.

The countries involved are: Bangladesh, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Sri Lanka, Thailand.

In brief, TECHNONET is a cooperative grouping which aims at improving the quality and efficiency of production in small and medium industries through the transfer of technological information and the development of industrial extension services. The project has been looked upon as an "experiment in cooperation".

The TECHNONET concept is not new. It has frequently been discussed before. Proposals have been made for technology data banks, new systems for the international referral of technological enquiries, reforms to the international patent system and, inevitably, new institutes where well-endowed researchers can develop theories about how it can all be made to happen.

Yet, while no one denies that the industrialized countries and the international agencies could be more effective in stimulating the diffusion of technology, at the same time there is a growing realization that the greater part of man's technological know-how is already freely available — and the biggest problem is that the developing countries are ill-equipped to find, evaluate and apply it. By strengthening the



Thailand: cottage industries like cloth weaving can benefit from the services TECHNONET offers.

capabilities of its participating organizations, TECHNONET aims to facilitate the transfer of technology and its assimilation by small-scale industries.

What is really new — and can be of enormous benefit to other developing regions in the world — is the proof that a system of networking can be workable. Developing countries have much to share with each other, and the developed countries through their technical assistance programs can strengthen this capability. In fact, TECHNONET draws upon the technological resources of various cooperating organizations in developed countries for some of its activities.

In Phase One, from 1973 to 1976, the TECHNONET project produced results that are attracting considerable attention. It now has a strong network of organizations which make available to one another industrial technical information on products and processes in their own countries that are readily obtainable. Empirical evidence — as reported in "cases" that are being compiled — indicates that technical information obtained from countries with similar stages of development is by far more useful and relevant than that imported from highly developed countries.

Participating organizations also make available to each other their technical personnel for short-term assignments. A monthly TECHNONET "Digest" has kept participating organizations informed of the latest technological developments in member countries.

In 1975 the Asian Industrial Extension Officers' Forum (ASINDEX) was created to give added impetus to this emerging profession. Formal training programs, seminars, workshops, and exchange visits have been arranged. The quarterly TECHNONET "Newsletter" facilitates communication among extension and information officers.

Governments now increasingly accept the need for this type of service and allocate resources for its further development. In the process, networking on a national level has also been encouraged and developed.

State-of-the art reviews have been undertaken to pinpoint problem areas and the assistance needs of specific industry groups. A list of experts and of sources of information in the participating countries has been drawn up identifying the needs and strengths of each member. The identification of "centres of excellence" in specific fields has been encouraged in order to minimize wasteful duplication of effort.

For example, the establishment of a Plastics Technology Information Unit within the Hong Kong Productivity Centre and the upgrading of the foundry workshop at the Industrial Development Board of Sri Lanka have been supported with the understanding that their expertise and facilities will be available to all the other participating organizations. The Institute for Small-Scale Industries of

the University of the Philippines has made available to participating institutions its modern low-cost automation laboratories as well as its excellent training facilities. The Singapore Institute of Standards and Industrial Research has made available to all participating organizations its excellent Current Awareness Service. The IDRC has also supported in part the establishment of the Asian Packaging Information Centre in Hong Kong and the International Ferrocement Information Center in Bangkok.

The TECHNONET project is now well into its second phase and is stressing the development of self-reliance to ensure that it will be able to continue in the future when external funding is tapered off or ceases. This objective has the strong endorsement of the participating organizations who are taking the necessary steps in that direction.

The "experiment" is by no means completed. The approaches and specific activities undertaken continue to be critically evaluated and improved upon. But this early, some lessons may be learned that could be of immense value to international agencies involved in development assistance and funding:

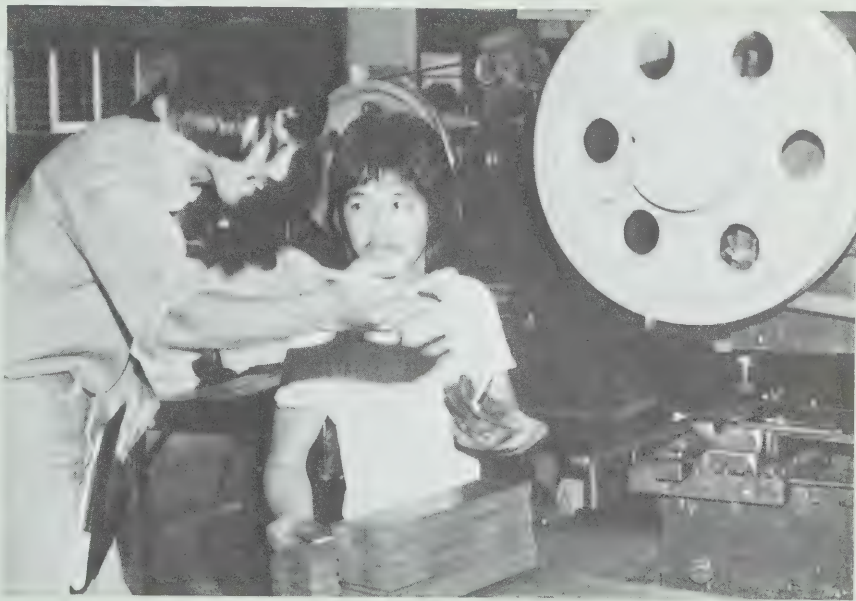
- by effectively deploying a proportion of its own technological manpower for advisory work, a developing country can be, technologically, much more self-reliant than has hitherto been imagined; what are most needed are not fancy new systems, but an indigenous capacity to apply well-

known and readily available technology to overcome actual problems as they are encountered on the factory floor;

- the effective transfer of technological information can be achieved only if properly "processed" — in this case, by the industrial extension officer, who acts as the link between the entrepreneur (who is often not capable of recognizing his problems and identifying his needs), and the sources of information, which can provide more relevant information when the request is more specific;
- developing countries have much to share with each other in terms of technological information, processes and expertise. What is needed is the stimulus to spur this cooperation and interchange and even bring to surface this capability — a role which can be properly undertaken by the international assistance agencies;
- the so-called "transfer of technology" is not a one-way street from developed to developing countries.

As mentioned before, much of the experience gained from the "experiment" had previously been mere theory. However, TECHNONET ASIA is now in the process of demonstrating that such concepts as *self-reliance* and *cooperation* are not mere slogans — they can be made to work. □

Leon V. Chico is Administrator of the TECHNONET Centre in Singapore.



Malaysia: industrial extension workers can provide practical advice and assistance right on the factory floor.

Asian researchers study pill safety

Marjorie Koblinsky

AN estimated 25 million women in the developing countries of Asia use oral contraceptives. Yet research studies continue to suggest a link between regular use of "the pill" and various diseases of the circulatory system, particularly thrombosis.

Most of the current research, however, has been carried out in the West, especially in the United States and Britain. In late 1976 a meeting of Asian researchers concerned with areas of safety of contraceptives that needed further investigation, was sponsored by the IDRC. Oral contraceptives emerged as a main priority, and since that time a number of research projects have begun to investigate the health risks to Asian women taking the pill.

In Hong Kong, where an increase in female patients with heart ailments was noted between 1969 and 1975. A systematic and in-depth review is being carried out of the records of women admitted for heart ailments to determine the extent of the increase, and whether there may be a link between the increase in frequency of the disease and the use of oral contraceptives.

Another study in Hong Kong will investigate the relationship between oral contraceptive use and antithrombin in III — a natural anticoagulant that appears to be diminished in people suffering from thromboembolism. Over a period of one year, 100 oral contraceptive users who are scheduled for pelvic surgery will be compared with 100 non-users, matched for age diagnosis and type of surgery. At the same time a comparison of Chinese and Caucasian users and non-users will be made to determine if there are any differences in the effects of the pill on the two ethnic groups.

Changes in glucose tolerance and insulin metabolism have also been noted in oral contraceptive users. An IDRC-funded Inter-University Collaborative Fertility Project has now shown apparent differences in the changes among Asian and Caucasian women.

Researchers from the Universities of Singapore, Malaya and North Sumatra showed that, whereas both groups of women had decreased glucose tolerance and slightly elevated insulin levels, only Western women showed a marked increase in cholesterol levels — an increase that may not be reversible. There were however, inconsistencies in the data, and further analyses are now being carried out.

Another problem associated with use of the pill is hypertension. Studies in the US and Britain have shown different reactions among black and white women, but other groups have not been so well studied. At Yonsei University in Seoul, the IDRC is supporting studies on the effects of oral contraceptives on metabolic changes related to hypertension in Korean women.

The Seoul researchers will also investigate the possibility that contraceptive steroids can be passed to the infant through the mother's milk, and the effect this might have on the breast-fed baby. This is an area of oral contraceptive research that has not previously been widely investigated.

A recent Ford Foundation study warned that a great deal more attention (and funding) must be given to "studies of intermediate and long-term safety of methods of fertility regulation now widely used, and new methods yet to be developed." Asia's researchers are well aware of that need, and their efforts to seek the safest possible methods continue to receive IDRC support. □

Dr Koblinsky is a program officer with the Centre's Health Sciences Division based in Singapore.

Every young and developing country expects a lot from good internal communications. Priorities are numerous but road construction is always near the top of the list. It is hoped that along with the roads, better services and increased incomes for the rural people will follow. But how does this happen in reality?

A research team in Southeast Asia has recently come up with a detailed set of facts to describe this reality. Under the supervision of Dr Niew Shong Tong from the Geography Department of Nanyang University, in Singapore, and Dr Lim Heng Kow from the same department but formerly with the University of Malaya, in Kuala Lumpur, the researchers studied the extremely heterogeneous State of Sarawak, in Eastern Malaysia.

Ethnically, geographically and socio-economically, Sarawak is made up of very different entities. The urban centres are predominantly populated by Chinese who migrated to Sarawak generations ago, while the rural areas are populated by some Chinese farmers and 24 indigenous groups.

The land itself is divided into three parallel strips with a central hilly region bordered by swamps on the China Sea coast and on the interior by mountains. The advanced sector of the economy is almost the exclusive lot of the Chinese while the Malays, on the coast, and the Ibans, Bidayuh and Kayans of the interior either fish or practice shifting agriculture.

For a long time, the numerous rivers that slice through the three strips of terrain were the only means of communication and transportation. Virtually all settlements were situated beside the sea or along a river. Before the last World War there was only a single mile of paved road in all Sarawak. But since the independence of Malaysia in 1963 the government has launched one ambitious plan after another to build a modern network of roads in Sarawak. In 1972, there were 1,250 miles of road, of which 250 were paved. Construction continues at an accelerated pace and when the Sibul-Bintulu road is terminated in 1978, Sarawak will have for the first time, a road through its whole length.

Since 1963, Malaysia has invested more than \$400 million Malaysian (US\$160 million) on roads. The cost is very high because of the many rivers that must be crossed, the lack of good quality sand and rock, and the tropical rains (100 to 200 inches per year) that erode the embankments.

But Malaysia is pushing forward in an effort to improve national unity by facilitating communications between the Chinese cities and the indigenous populations of the rural areas. The government means also to provide access to new lands for the Chinese population and to settle along the roads the people of the interior who use large areas of valuable land for shifting agriculture. It is hoped that the indigenous populations

Sarawak's new roads bring change to the rural people

Jean-Marc Fleury

will settle in Land Development Schemes where they will cultivate cash crops (rubber, pepper, palm oil) using modern agricultural practices. With the socio-economic development of Sarawak, the government wants also to reduce the gap between the more advanced peninsular Malaysia and the still largely backward Sarawak.

The rapid extension of the road network into advanced as well as very traditional areas of Sarawak provided an excellent opportunity to study the socio-economic impact of roads in a developing region. The study team of 25 researchers from the University of Malaysia and three from Nanyang University conducted more than a thousand interviews in urban centres, villages, and in the longhouses of the Ibans, Bidayus and Kayans. The analysis of the data is not yet complete, but preliminary reports already provide a good picture of the role a major road has played in Sarawak.

Changes were quite apparent on both sides of the road. Where the road has moved into a region populated by Ibans living in longhouses, some families have relinquished the communal life and now live near the road in individual dwellings. In other areas occupied by Chinese settlers, pepper gardens have sprung up along the newly built roads. Roofing material, bricks, asbestos and cement are now much more widely seen while the use of electricity and piped water has increased by as much as 20 percent. In the government Land Development Schemes, most of the families enjoy electricity and piped water. This is completely new for the areas set up before the advent of the roads, but these services are built right into the developments now being opened up along the new roads.

One of the most dramatic impacts of the new road was to cut travel time by 70 percent. Between 20 and 30 percent of the people no longer have to walk to the market. This percentage should increase very rapidly as more and more feeder roads connect the settlements to the trunk road. In most regions buses now carry the small farmer with his load of vegetables or paddy rice. In the eastern part of Sarawak roads and development came so rapidly that bus services were not implemented and cars and trucks are preferred. But two-thirds of the families do not own a bicycle, a motorcycle or a car.

The researchers found that farm products like rice, fruits, vegetables and

chicken are sold more often now, and usually go directly to the town shops, bypassing the middlemen. Fruits, vegetables, chickens and pigs are produced on a much wider scale in the farms near the large centres, raising the income of the small farmers.

Other agricultural products that can be easily carried in bulk, like pepper and rubber, are now being taken from the farms by trucks sent by wholesalers from the main cities. Before the roads, transportation originated from the rural areas toward the centres, now the pattern is reversed. Government marketing agencies can now also get to the rural areas to offer fixed prices to the farmers for their pepper and rubber.

All these new communication patterns are contributing to pressure the farmers out of the subsistence economy and encouraging them to participate in the wider cash economy.

The young generation is also feeling the pull of the wider world. Immigration is accelerating with the connection of the settlements to the trunk road. Two thirds of these migrants are in their teens and most of them are young girls. The cities, which are developing more rapidly, offer them better jobs, mainly in

the government, but many end up in the burgeoning bar business.

In the long term, their young brothers and sisters will probably be more qualified and able to get more challenging jobs since it is now much easier for them to go to school. In one region where most of the children had to walk to school, now two-thirds board a bus. Much still has to be done however, since in all the settlements studied an average of 60 percent continue to walk to school.

The report stresses as its main point that roads alone will not bring development to a backward region and suggests multifaceted policies to make sure that the roads will bring the desired improvements.

First of all, provision should be made to facilitate the ownership of simple transportation means like a bicycle, the prime vehicle of development, or the creation of bus companies. There are now only 32 bicycles for each 100 families in Sarawak. There is also a need to step up rural extension work in order to educate farmers in the use of fertilizers and new agricultural methods. This, Drs Niew and Lim suggest, should not be done anymore with the "spoon feeding" approach but by giving the traditional communities a chance to take their development in their own hands. The community spirit should be preserved and used to promote progress, they say. Finally, the report recommends that rural industries be set up to provide challenging job opportunities for the young — rice mills, brick works, pepper, oil palm, timber, cane and rubber factories.

Malaysia has vowed to integrate the different entities of the State of Sarawak in order to promote national unity and development for all. The government is constructing roads as a major component of this thrust; the amount earmarked for rural roads in the Third Malaysia Plan has been quadrupled to \$477 million recently. The State Planning Unit helped the University team in its field work and the project was supported by an IDRC grant. When the final report is submitted early in 1978 it should assist the Government of Malaysia in the continued reassessment of its development efforts. □

Jean-Marc Fleury, science writer with the Centre's Publications Division, travelled to Sarawak on a recent visit to Asia, and discussed the project with many of the researchers involved.



The new roads bring many changes to the rural areas, and to the small towns along the way.

Photo: Jean-Marc Fleury

Rural health surveys hazardous — but rewarding

Marilyn Campbell, editor-in-chief of the IDRC's Publications Division, recently attended a meeting in Nepal on Applied Research for Health Service and Manpower Development. The following article is based on her conversations with the organizers of a rural health research project in Nepal that could well provide an example for other countries facing similar problems. A full description of the project will appear in the report of the meeting, soon to be published by the Centre.

In a remote village in Nepal, the earnest young interviewer politely questions an old man about his health. Coughing, the old man says he has no complaints. That cough? It's nothing. "If an old man doesn't cough, who does?" he wants to know.

The interviewer is one of a team of

eight young people recruited to survey community health needs in rural Nepal. The old man is one of hundreds of villagers interviewed, and his enigmatic response is typical of the attitude of a people to whom minor ailments, and sometimes major ones, have become so common as to go unnoticed.

That survey was carried out over a two-month period during 1977, and was one of several undertaken as part of a health manpower development project begun in 1975 by the Tribhuvan University Institute of Medicine, Kathmandu, with the support of the IDRC. The aim was to discover at first hand what the rural people perceived as their health needs, and to draw up an inventory of the health services presently available to them.

For the interviewing team, all but one of whom were city born and raised, the assignment took on other aspects — it

became part adventure, part endurance test, and above all an introduction to a segment of their own people and culture that they had never before experienced.

The team members were selected as much for their likely ability to withstand the rigours of two months interviewing as on the results of written and oral examinations. Before going into the field they received four weeks' intensive training, covering everything from interview techniques and the use of forms, to vaccinations and the complications of pregnancy. But it is doubtful that any amount of training could have prepared them for the physical and cultural shock of their mission.

Nepal's terrain is as rugged as it is varied, ranging from jungle to rocky mountainside. The young researchers were often obliged to camp out in the open on treks between villages. All suffered from minor ailments — head colds and diarrhea being the most common. Their biggest problem, however, was simply one of understanding and adjusting to the village people and their way of life.

Arriving late one afternoon at a village after a day-long trek, the interviewers were delighted to find a festival about to begin, and joined in the dancing with enthusiasm. But some of the villagers took offence when the weary travellers eventually decided to call it a night at about 11:30, and they were obliged to barricade themselves in their billet until their irate hosts calmed down the next morning. No interviews were conducted at that particular village.

Fortunately, they learned fast, and while there were doubtless many more embarrassing moments, the interviewers were soon able to develop a rapport with the rural people that enabled them to break down much of the natural reserve that overcomes people when discussing something as personal as their health. It took patience and sensitivity to probe behind that unconscious tendency to conceal information: to find out about the old man's cough, or a woman's backache, or her child's diarrhea.

The wealth of data amassed by this and similar surveys will be invaluable in planning and implementing a health service for rural Nepal that is based on the needs of the rural people themselves, and in developing revised curricula for training health professionals.

As for the team members, now back in the comfort of Kathmandu, they learned much about the rural people — their hospitality, their friendliness, their songs and their stories. They probably grew a little in the process, too.

It is too early yet to talk of the long-term effects of the survey. But it is likely that, whatever the outcome, at least some of those eight young researchers will continue to be involved with serving the health needs of Nepal's villages. Their experience is a unique resource that is too precious to be wasted. □



A young interviewer talks to an old woman in a village in the Pokhara Valley — for both it is a new experience.

New film aims to reduce grain losses

Bob Stanley

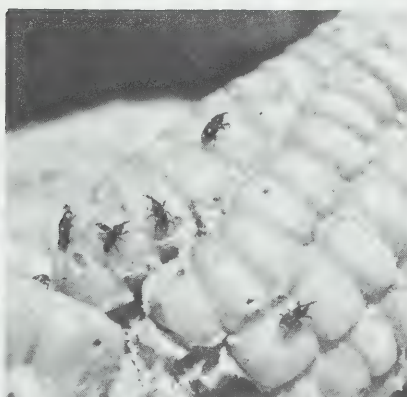


Photo: Neill McKee

Top left: Traditional storage — maize hung from a tree is exposed to insects, birds, and the elements. Above left: After drying in the fields, maize is dehulled in preparation for storage. Top right: Weevils are a common grain store pest. Centre right: Entomologist and scriptwriter Christopher Warui discusses grain storage with a village woman during a filming break. Above right: McKee and filming crew on location.

In Kenya, as in many other developing countries, huge quantities of grain are lost every year to the ravages of insects and rodents, or simply as a result of inadequate storage facilities.

When the Harvest is Over is a new film designed specifically to cut down these losses. It is a unique co-production of the Kenyan Ministry of Agriculture's National Agricultural Laboratory and the IDRC.

Maize is a major crop in Kenya, but losses due to insect damage alone are estimated to cost the country as much as 100 million shillings (\$12 million) each year. The majority of Kenya's farms are small, from two to four hectares, and most farmers still use traditional methods of grain storage. As part of a concerted effort to reduce the huge losses, the Ministry of Agriculture decided to make an instructional film that could be shown to extension workers, farmers, and grain store keepers throughout the country by means of mobile cinemas. The IDRC was asked to assist in the project.

In November last year Neill McKee, head of the Centre's small Audiovisual Unit, flew to Kenya. A script had been prepared in English by entomologist Christopher Warui, and a Swahili version by Suleiman Juma Hagamas, who also recorded the Swahili commentary. With McKee doubling as cameraman and producer, assisted by David Malunga, a sound technician from the Ministry's Agricultural Information Office, the team had the film "in the can" in just three weeks. Comments McKee, who has made numerous films in developing countries: "It was the best organized filming trip I have ever been on."

McKee edited the footage in Ottawa, a rough-cut version was sent to Nairobi for final approval, and the production was completed, in English and Swahili, before the end of January. The result is a 34-minute 16mm colour film that explains in simple terms the reasons for grain losses, the various ways they can be prevented, and the importance of taking these measures.

In the words of Christopher Warui's script: "The work only begins in the fields. Farmers must realize the importance of proper storage and handling of their grain. . . . that well preserved grain is more food for their families and more money in their pockets."

Soon that message will be getting across to farmers throughout Kenya as the mobile cinemas and the extension workers go out to the villages to show the important work that must be done — when the harvest is over.

□

In search of a better banana

Michael Graham



Banana market in Ecuador.

Banana growers, whether small farmers or large producers, face much the same problems: little work has been done on improving cultural and management practices except in large export plantations, pest and diseases take a heavy toll on crops, losses are high during harvesting and transportation, and few new products have been developed to make use of their crops.

What could be done to solve these and other problems was discussed at a workshop on the Identification of Priorities in Banana and Plantain Research, held at CIAT in Cali, Colombia, in September. The seminar was co-sponsored by the IDRC and UPEB (Union de Países Exportadores de Banano), a government organization of banana producing countries — Colombia, Costa Rica, Guatemala, Honduras, Panama and the Dominican Republic — aimed at improving banana production and increasing crop diversification in member countries.

Within the UPEB countries, banana and plantain are generally grown either on large plantations for export, or on small farms where they are usually cultivated in association with both perennial crops, such as coconuts, coffee and cocoa, and annuals such as beans, corn and sweet potato. Unfortunately, little or no research has been directed to this kind of cultivation, probably because these cropping systems are inefficient in large plantations.

The research that has been carried out, and is ongoing, in Latin America is generally conducted by private research groups, and few of their findings make their way to the small growers. UPEB has therefore proposed to inventory all research concerned with bananas and plantains. In addition to emphasizing mixed cropping systems, UPEB will stress the need for crop diversification projects to broaden the region's agricultural base and to make better use of land not ideally suited to banana and plantain growing.

Plantains, unlike bananas, are grown mainly for the local market. For this reason the management of this staple food crop has received but limited attention, and it has been assumed that the results obtained with bananas could be applied directly to plantain. This has yet to be proven. The initiation and intensification of research on this starchy food crop, as well as on bananas, is necessary, particularly in the fields of plant nutrition and fertilizer management, the relationships between nutrition and fruit quality, irrigation methods and the formulation and management of pesticides.

This last area has to date received the most attention, as bananas are susceptible to a number of pests and diseases. In terms of production losses, nematodes are by far the most serious pest in the region, but little is known about their direct effects on banana growth and bunch weight. Losses in production due to these pests result mainly from blow-downs caused by a weakening of the plant's root system. These can be prevented to some extent by propping; however, any long-term solution will probably be based on breeding new clones with nematode resistance. At present, only expensive chemical controls prevent severe losses and further investigation is required on the dosages and frequencies of nematicide application that will produce the best results.

Root borers on the other hand are not usually a problem in well managed plantations where chemical controls are fairly successful. They can, however, be more serious under poorer conditions, on marginal lands, and thus pose a problem to small-scale producers. Yet another threat to small farmers is

Moko disease, a bacterial wilt, that can be controlled by rapid weeding out of the affected plants, combined with strict phytosanitary controls.

Black Sigatoka, a serious leaf spot disease caused by a sooty mould, causes severe damage to the Cavendish group bananas, a dwarf variety also known as Canary or Chinese bananas, and to some plantain varieties. Although this disease can be controlled by carefully organized spraying, this method is expensive and often impractical for small farmers. A secondary problem has arisen because this fungus is showing signs of tolerance to some of the chemicals used. In addition, there are indications that new strains of Panama disease, another fungus, may be capable of infecting the normally resistant Cavendish varieties.

Chemical controls are at best, and will continue to be, short-term solutions. In the long run, it will be necessary to establish "damage thresholds", in other words, assess how much damage the plant can sustain before yields decrease and what level of fruit damage the consumer will accept. Once this has been done, ecological studies to quantify the myriad of existing natural controls should be completed. By combining these studies with efforts to breed resistant banana and plantain varieties, long-term solutions may be found.

Priorities in any banana breeding program should include the need for increased funding for some of the existing breeding programs aimed at producing export and locally acceptable varieties. According to the workshop participants, this will require the consolidation of germ-plasm collections and their expansion to include new collections of local varieties. To do so will require agreement on safe and rapid methods of distributing the breeding material and the establishment and observation of phytosanitary regulations.

The establishment of such an international germ-plasm collection has been given high priority by the International Board for Plant Genetic Resources, which will establish the collection in the Far East and a duplicate in the Americas.

The breeding of new banana varieties combining disease resistance, high productivity and consumer acceptability poses particular problems as most bananas are naturally sterile and therefore cannot be crossed. *In vitro* studies may possibly lead to the raising of embryos from plants with low levels of fertility enabling the cultivation of plants with desirable characteristics.

Unfortunately the benefits that can be derived from improved cultural techniques and the development of more resistant varieties will be much lessened if losses continue to be high during harvesting and transportation. To develop better postharvest techniques, existing technologies must be adapted to local needs in order to minimize waste and ensure the delivery to the consumer of good quality, reasonably priced fruit.

Bananas are usually harvested in the hard, green state and transported to boxing stations on the stem. Hands or clusters of several fingers are cut from the stem, immediately washed with water to prevent latex staining, treated with a crown rot fungicide and packed in cartons holding 15 to 18 kilograms of fruit. Bananas destined for distant markets are usually sealed in polyethylene bags of selective permeability, thus creating a modified atmosphere that helps prevent their ripening during transport. In addition, an ethylene absorbant has recently been successfully used to delay ripening for up to three weeks at temperatures of 20-30°C. Once at destination, ripening is

induced by treating the fruit with ethylene under controlled temperature and humidity conditions. The fruit is then delivered to the retailer.

This process depends heavily on selecting green fruit at the right stage of maturity: the fruit must be green enough not to ripen before it arrives at the ripening rooms. Premature ripening is a prime source of postharvest wastage and downgrading of bananas. One ripening banana in a cargo is in fact sufficient to start the process in adjacent fruit. A solution to this problem is to harvest relatively immature fruit, but then the harvested weight is much lower. Needed is a simple procedure that would enable the farmer to pick the fruit as full as possible but green enough not to ripen before it arrives at the market. Various efforts are now being made to develop such a procedure.

On the farm handling and packaging present few unsolved problems, but there is need for the growers to gain direct experience in the various operations and to adapt them to local conditions. In the Windward Islands, for example, field dehanging and transporting has proven more successful than the usual procedure of carrying bunches to the boxing stations, a practice that may also be suited to the UPEB countries.

Research is also needed on washing procedures to prevent latex staining where water is in short supply, on the rate of application and the effectiveness of crown rot fungicides, on the suitability of locally available packing cartons and on the development of optimum packing procedures.

Some work is now being done on the development of new products which would diversify the use of bananas. A nutritious food, they could be used in baby foods, and banana meal could be substituted for wheat meal in baked goods. Other products being investigated include banana nuggets, starch, puree and even a carbonated banana drink.

Waste bananas could also be used in a number of ways, but at present few integrated approaches or priorities have been established for research in this field. Some national institutions, particularly in Ecuador, Costa Rica and Guatemala, have reported some success along these lines. The industrial extraction of banana starch and meal, the use of discarded bananas for animal feed and as an energy source for microbial enrichment, are all possible. Other parts of the plant may also yield useful products, for example, leaf protein for use in animal feeds and plant fibres for rope or paper pulp. To be successful, the efforts must be properly coordinated and accompanied by economic feasibility studies to set priorities and evaluate the alternative products.

Underlying the workshop's recommendations is the urgent need for greater cooperation, for the coordination of ongoing research, as well as for the establishment of guiding principles for future research. UPEB and IDRC together have taken the first step in this direction. Methods of implementation of the priorities outlined at the workshop will be discussed at a future meeting to be held in Panama. By working together, the banana producing countries of Latin America may succeed in improving the industry, to the great benefit of their small-scale banana and plantain growers. □

Michael Graham, a technical editor with the Centre's Publications Division in Ottawa, attended the UPEB-IDRC workshop in Cali.

WINNING THE BATTLE AGAINST SMALLPOX

Rahima Banu, of Kuralia village on the island of Bhola off the mainland of Bangladesh, is famous. On 16 October 1975, at the age of three, she was reported to be the last person in the world to have *variola major* — the classical and often fatal form of smallpox.

Two years later, after a team of 12,000 health workers assisted by WHO staff had made repeated house-to-house searches throughout Bangladesh without finding a single new case, Dr Halfdan Mahler, Director-General of the WHO, declared: "We have signed the death certificate of smallpox in Asia. . . . She was the last case in Bangladesh, the last case in Asia, the last case of *variola major* on earth."

The battle is not quite over, however. *Variola minor*, a less virulent disease, is still known to exist. The campaign to eradicate it is now focussed on the "Horn of Africa", in Ethiopia and Somalia, where the number of cases has been falling steadily.

The WHO is in the process of setting up an international commission to assemble the necessary evidence to confirm the eradication of the disease. Once global eradication has been certified, vaccination against smallpox could cease — freeing for other health purposes the nearly \$2 billion spent annually on smallpox vaccination and quarantine programs.

LEARNING IS THE NAME OF THE GAME

What better and pleasanter way to learn than by playing? And that is how primary students in many parts of Togo are learning basic health and hygiene — by playing a board game called *Mana*.

Mana is the brainchild of Mr Dogbevi Ehlan, Director of the National Health Education Service of the Togo Ministry of Public Health. Following the recent introduction of health education into the primary school curriculum, he had sought to strengthen the teachers' knowledge through a series of seminars designed primarily for teachers in rural areas. But, he reasoned, the students also needed an incentive to make learning and practicing personal, family

and community health easier. And health, like other subjects, needed to be taught in a truly African way.

Mana fills these needs. A simple game for two players, it consists of a board divided into 30 squares, each of which corresponds to a question, ranging from a simple "Are your hands clean?" to more complex topics such as immunology, disease transmission and nutrition. The game begins with a throw of the dice: the first player moves his piece to the square corresponding to the number thrown. A correct answer to the question on that square, and he moves forward two squares for another question. A wrong answer, and he drops back two, and the second player takes his turn.

Mana can be easily adapted to other subjects. Work is now underway to introduce it at the secondary level, and in literacy and community development programs, where it is hoped the results will be as good as those in the schools around Lome, where both teachers and students have taken to "learning by playing", and exam results have been excellent.

APPOINTED TO ADVISORY COMMITTEE

Louis Berlinguet, Senior Vice-President of the IDRC, has been appointed by the United Nations as a member of the Advisory Committee on the Application of Science and Technology for Development (ACAST).

The Committee is composed of 28 distinguished scientists from as many countries, who serve as special advisers to the UN Economic and Social Council. ACAST will play a major role in the forthcoming UN Conference on Science and Technology for Development to be held in Vienna, Austria, in September 1979.

A biochemist, Dr Berlinguet served on the IDRC's Board of Governors from the time the Centre was established in 1970 until his appointment as Senior Vice-President in 1976. He has also served on numerous other scientific bodies, including the Quebec Institute of Scientific Research, the Fisheries Research Board of Canada, and the grants and scholarships committee of the National Research Council of Canada. A Fellow of the Royal Society of Canada, he was invested as an Officer of the Order of Canada in 1975 in recognition of his contributions to education and science research.

ARMING HEALTH WORKERS WITH BRACELETS

In remote villages of India health workers are using bangle bracelets to identify toddlers suffering from severe malnutrition (see also *The tri-coloured strip* on p.8). In use since 1975, the bangle test takes only moments to perform, and has proved very useful to health workers who are illiterate or have no training in nutrition anthropometry (human body measurements).

A bangle of four centimetres internal diameter is slid onto the child's extended arm without forcing or twisting. If it passes above the elbow at first push, the child is considered malnourished. In general, the older and better fed the child, the more likely it is that the bangle will be stopped by the hand rather than the forearm, the forearm rather than the elbow. The bangle test is said to be effective for children between the ages of one and five, as arm measurement changes very little, and the elbow is not prominent.

Hundreds of bangles made of glass and plastic and costing one cent apiece at markets throughout India have been distributed to auxiliary health workers. Although it is not as accurate a tool as a weighing scale, the bangle is simple and effective as a device for screening out children suffering from marasmus, for conducting village health surveys, and for teaching village women about nutrition.

FOOD THAT GLOWS IN THE DARK?

Improved techniques for food preservation have become increasingly important in an era where keeping world food supply ahead of the demands of an increasing population has become a struggle (see also p. 21). Late last year some 170 experts from 36 countries met in Vienna, Austria, to exchange notes on a novel new way of preserving food: irradiation.

Research on the use of ionizing radiations emitted by isotopes or generated in electrical machines to preserve food has been going on for some time, according to a news release from the International Atomic Energy Agency (IAEA). Some 26 irradiated food items have now been cleared for "limited" or "un-

restricted" human consumption — including potatoes, onions, meat, fish, grain, and grain products. The release does not explain what is meant by "limited human consumption", however; and while it talks of the importance of reducing postharvest food losses, "especially in the developing countries", it does not explain how such sophisticated technology might be brought to the poor African or Asian farmer.

It's early days yet though, and the purpose of the Vienna meeting (sponsored by the IAEA, the Food and Agricultural Organization, and the World Health Organization) was to review work in the irradiation field to date, to evaluate results, and to plan further development of the technique if it could be shown to be worthwhile. After five days the symposium concluded that it was indeed worthwhile, and that "the potentialities of this physical process justify intensification of further work on technological application ..." etc.

Through the wonders of modern science we may yet get food that not only lasts longer, but also glows in the dark!

WHAT'S NEW IN CASSAVA RESEARCH

A new channel of communication for scientists working on cassava has opened up with the publication of the first *Cassava Newsletter* by the Cassava Information Center at CIAT (the International Center of Tropical Agriculture in Colombia). The newsletter is part of a special cassava information project supported by the IDRC, and will be published twice yearly in English and Spanish.

The highlight of the first issue is an article outlining Brazilian efforts to distill fuel alcohol from cassava to replace gasoline in cars among other uses, and the promising potential for cassava both as a renewable energy resource and as the basis of a new chemical industry. Other topics include reports on cassava programs in Mexico, the USA, South Africa, and Thailand; a cautionary note on the danger of importing cassava diseases; and brief abstracts of some current literature.

The *Cassava Newsletter* is available free from: Trudy Brekelbaum Martinez, Editor, Cassava Information Center, CIAT, Apartado Aéreo 67-13, Cali, Colombia, SA.

COMMENTARY

Developing countries should be big food producers

Late last year the former President of the IDRC, Dr. W. David Hopper, was interviewed by Robert Reford of the Canadian Institute for International Affairs for one of a series of taped programs on Canada/Third World Relations being prepared by the Ontario Institute for Studies in Education. The subject was "Changing economies and agriculture", and Dr. Hopper, who moved to Washington in January to become Vice-President for South Asia at the World Bank, gave his views on the world food situation and the prospects for world food sufficiency in the year 2000 and beyond.

Following are extracts from that interview, with Reford, a former journalist, putting the questions.

I would like to start by looking at what I think we are all now beginning to realize more and more is a major problem: the problem of food. Are we going to have enough food?

We have a vast potential in the world for increasing food production, but as yet we have not tapped that potential, and it is going to take time to do it.

At the present time the populations of the developing countries represent about two-thirds of mankind, but they produce less than one-third of man's food. If present population trends continue (and I am not an alarmist on population, I believe we can feed a much much larger population, and I already see signs of a slackening in population growth) we will be in the year 2000 with roughly three-quarters of the world's population in the developing countries. They will still produce, if present projections hold, less than 30 percent of the world's food. On that basis we have a very severe food imbalance. It will either mean that the developed countries are going to have to transport more food to the developing countries, probably on some sort of concessionary terms because these countries do not have the foreign exchange to pay for it, or we are going to have to raise food production in the developing countries.

The drought of 1972, which was a worldwide drought, was what caused the big run on the grain stock supplies of the US and Canada. A similar circumstance today could be met, because again Canada and the US have had bumper harvests, but the difference between today and 1972 is that in 1972 there were 60 million acres of land in the soil bank in the US; that 60 million acres is now under plough. We are now pushing against the capacity of the temperate zone to produce food.

That said, my concern is that the developing countries should be the big food producers, not the residual food producers. They have the sunlight, they have the water, they have the year round growing temperature, they can grow three or four crops in sequence one after the other, which we cannot do. It is the

lag in their agricultural development that has been my major concern.

The issue is resources. Just take a drive through our rural areas and take a look at the networks of roads, of service facilities, of machinery depots, of supply facilities, of milk pickup points, of packing plants, and so on, that are all part of our agriculture. Then drive through India, where the roads are 30 or 40 miles apart, where there are none of these facilities, where villages are deep in the interior, where all the paraphernalia of a modern agricultural economy does not exist. That is what has to be built in the developing countries if they are going to pursue their agricultural potential, if they are going to build a modern agriculture and really tap the resources that they have. To do that is going to take colossal amounts of money and they don't have the resources.

The Sahel is a very good example. There are five rivers and a very large lake, the Lake Chad Basin, in this region. Each one of these rivers could be tapped. They could greatly increase the land that they have under irrigation, to produce the kind of crops that they need. The six Sahelian nations among them have about \$2 billion of GNP (Gross National Product). It is a ridiculously small GNP. It is less than the profits of the General Motors Corporation. To develop the five rivers and the Lake Chad Basin would cost something like \$30 billion. For these countries to say "We are going to embark upon that development" with a GNP that is as small as they have is just ludicrous. It is like Canada, with our GNP of \$150 billion, saying that we are going to proceed to develop our north although it is going to cost us, say \$1 trillion. It won't be done. Somebody has got to provide the resources if those nations are going to be brought to the point of feeding themselves.

For an investment over the next 10 years of approximately \$100-150 billion, and these are very rough estimates, I think we could provide food security for both the populations of the year 2000 and possibly for the populations of the year 2050, when I do see population



David Hopper, former IDRC President, now with the World Bank.

beginning to level off, mankind having a total population then of about 15 to 16 billion people.

Why isn't it being done?

I think there are three reasons. In the first place the food resources of the world have been sufficient to tide all of mankind through. We have lived in a remarkable period — there has not been a major famine in the world since 1942. Now, there is no other period of almost 35 years of world history where we can identify no really major famine. We haven't had it because the grain reserves of the North American continent, Australia and Argentina have underpinned the periodic recurrence of drought in these large-population countries. With that there has been a lack of urgency.

The second reason is that the developing countries themselves have very limited resources, and the urban industrial complex has attracted the bulk of the investment in the developing countries. They are concerned with building their industries, they are concerned with modernizing the cities, and they have neglected their agriculture.

The third reason simply has to do with the costs involved. No agency, not even the World Bank, has yet been able to muster the resources necessary to mount these very high cost programs, and until the governments of the world are willing to stand up and say "Yes, we are all going to pitch in and cooperate" we are not going to get it done.

What happened to the Green Revolution?

For many of the developing countries the Green Revolution varieties, the new high-yielding varieties of wheat, and rice, and sorghum, and maize, would make a terrific difference, but they do not have the infrastructure supporting the decision by the farmer to move to the modern agriculture. And it is that infrastructure that has got to be built.

Can we transfer modern agriculture from our society, as we know it, to the developing world?

What we may not transfer is the high productivity per worker that we have in our agriculture. We may follow what the Japanese have done, and that is a very high productivity per acre. Our productivity per acre in Canada is really very low compared with Japan. We are producing just a little over one metric ton per hectare on our Western grain farms, in Japan they are producing between six and seven metric tons per hectare of rice. They have very small farms in Japan, but they have put the inputs in — the intensive agriculture, the intensive labour that goes to producing a very high yield per hectare, and that's the road the developing countries have to go.

We can help them with the building of the infrastructure, we can help them with

the scientific research, and this is where the IDRC is basically operating at the present time, we are financing research in developing countries. The new dwarf wheats that underpinned the so-called Green Revolution cost the Rockefeller Foundation perhaps \$10 million to develop over 20 years. When they came into India it was a very cheap transfer, but it cost the government of India \$280 million the first year to buy the fertilizer necessary for these crops. So there needs to be, accompanying the technology, a very heavy investment in the infrastructure of supply to the farmer to back him up as he picks up this research.

There must be some things that you have done that you are proud of.

My work in the Indian village in the early fifties convinced me, after visiting all the research stations in India, that the problem was not the Indian farmer, he was not stubborn and unwilling to change. It took seven years to get hybrid corn spread reasonably well in the province of Ontario (Canada). It took only three years to gobble up all the irrigated acreage in India with the dwarf varieties of wheat. India has more than doubled its wheat production from what it was in 1966. India now produces 50 percent more wheat than Canada, and wheat is not their most important crop, rice is. And exactly the same thing occurred in the rice area of agricultural production.

Is India reaching the point of self-sufficiency in food?

India now has a huge surplus in stock; she has over 20 million tons of food grain in a buffer stock at the present time. India can now sustain a very substantial drought and feed herself from her own resources. But if the population continues to grow, agriculture in India will have to grow faster than it has been growing in the past decade.

Let me give you an example. The Mahanadi River delta at the present time produces about three million tons of rice annually. With an expenditure of about \$1 billion over the course of the next 10 years, rice production could be increased to ten million tons. That extra seven million tons of rice in one year would be worth about \$1.4 billion at the present price of rice on the world market. So India pays off the investment in one year's increase in production. It is a question of how India gets the \$1 billion for that purpose.

What about Canada? What has Canada been doing, and what can Canada do?

My own feeling is perhaps that Canada has been too much "me too" in the foreign aid game, when it could have branched out more aggressively to provide world leadership in particular areas. I use agriculture as an example. Canada does have a unique position with regard to the developing countries as being a

very neutral country. I think that if we in Canada had said "Look, our concerns are going to be primarily in the problem of feeding hungry nations and hungry people," I think we could have carved ourselves a niche that would have provided far more leadership.

Canada has played an important role. We are in the upper average group of the industrial nations in what we do to assist in developing countries, and for the most part the projects that Canada has supported in the developing countries have been good projects.

What about the individual Canadian? What can I do?

I think that the individual Canadian can become more aware of the issues facing the developing countries. We are going to face in the not-too-distant future the trade-aid question. Many of the developing countries have the skills, the labour force and the industrial base that allows them to compete at the lower end of the consumer goods area — textiles, ready-made shirts, shoes, and so on. These do affect Canadian industry, and Canada has put quotas on developing country products. We in fact may do more harm to the progress of the developing countries when we put these quotas on than we would do good by increasing our aid flows to them.

These are issues that are going to be on the agenda in the future. It is either going to be a very much larger aid transfer, or it is going to be a freer access for the developing countries to Canadian markets.

And do you still remain an optimist?

On the food question, yes. Despite the fact that my feeling is that time is short, that time is quickly running out on us, I see moves by more and more of the developing countries, and even by some of the developed countries, to come to an accommodation. The only new United Nations fund created in the 1970s was the \$1 billion which the nations of OPEC and the developed industrial countries put up for the international fund for agricultural development. I think that within 10 years it is likely that, if these trends continue and we do not become complacent again, we will see the foundations laid for an agricultural development movement which is not going to be stopped. □

Copies of the complete interview on tape may be purchased from the Ontario Institute for Studies in Education, 252 Bloor Street West, Toronto, Canada, M5S 1V6.

New publications

CASSAVA BACTERIAL BLIGHT

report of an
interdisciplinary workshop
held at
IITA, Ibadan, Nigeria,
1-4 November 1976.



Cosponsored by the
International Development Research Centre
and the
International Institute of Tropical Agriculture

Editors:
Gabrielle Persley
Eugene R. Terry
Reginald MacIntyre

IDRC-096e

Cassava Bacterial Blight, Gabrielle Persley, Eugene R. Terry, and Reginald MacIntyre, editors. Published January 1978, 36 pages, IDRC-096e.

This is a report of an interdisciplinary workshop co-sponsored by the IDRC and the International Institute of Tropical Agriculture, in Ibadan, Nigeria. The eleventh in a series of cassava reports published by the Centre, this booklet contains abbreviated version of all the papers presented at the workshop, country statements, and a list of participants.

Remote Sensing in the Sudan. Published February 1978, 36 pages, IDRC-TS9e.

This technical study describes one of a series of five projects in which the IDRC is helping developing countries build their capacities to exploit satellite remote-sensing (Landsat) data for thematic cartography. Compiled by the project participants, it includes a description of the project and the training course, an evaluation, and recommendation for future work.

Compost, Fertilizer, and Biogas Production from Human and Farm Wastes in the People's Republic of China, Michael G. McGarry and Jill Stainforth, editors. Published February 1978, 94 pages, IDRC-TS8e.

In China human and animal by-products are looked upon not as wastes to be discharged as pollutants into the environment, but as out-of-place resources, and valued as low-cost sources of energy to be treated and then recycled. This collection of papers, translated from the Chinese, describes the design, construction, maintenance, and operation of the technologies that the Chinese use in these processes. It represents one of the very few reports from China giving empirical data on these techniques.

The Cost of Foreign Aid to Developing Countries, by Nihal Kappagoda. Published February 1978, 16 pages, IDRC-TS12e.

In this study, Mr Kappagoda, formerly Director of External Resources at the Ministry of Planning and Employment in Sri Lanka, and currently Vice-President International of the IDRC, examines the "cost of foreign aid" in both economic and political terms. Drawing on his personal experiences to analyse the international debt situation, he adds a valuable dimension to the current re-thinking about development issues.

For details of how to obtain copies of these and other IDRC publications, see advertisement on the back cover of this issue.

Ivan Head - new President

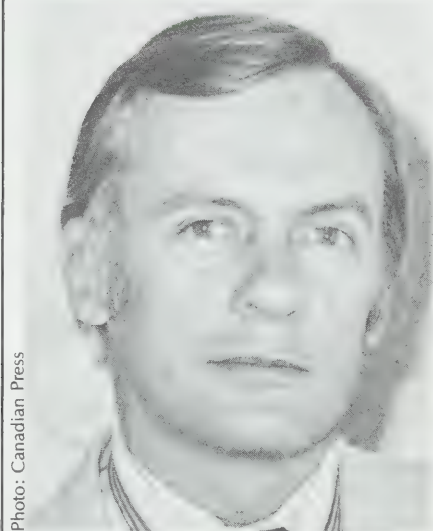


Photo: Canadian Press

The new President of the International Development Research Centre will be Mr Ivan L. Head. Confirmation of the recommendation of the Centre's Board of Governors by the Government of Canada was announced by the Board Chairman, Mr Maurice Strong, on 16 February.

Mr Head has served with the Department of External Affairs in Southeast Asia and in Ottawa. A graduate of the University of Alberta and Harvard Law Schools, he became Professor of Law at the University of Alberta, and was later appointed Associate Counsel to the Minister of Justice of Canada. For the past 10 years he has served as Senior Adviser to the Prime Minister, with special responsibility for International Relations.

The new President met the staff of the Centre at a special informal meeting on 17 February. In his introduction, Mr Strong said the Board had been faced with what at first appeared to be an "impossible task" — filling the shoes of former President W. David Hopper, who left the Centre at the end of 1977 to become Vice-President for South Asia with the World Bank. However, Mr Head had been selected, he said, as the best possible choice from an impressive field of candidates to guide the Centre through the changing and challenging times ahead.

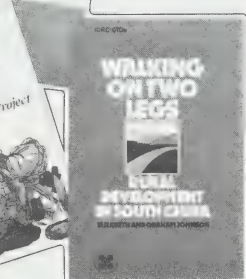
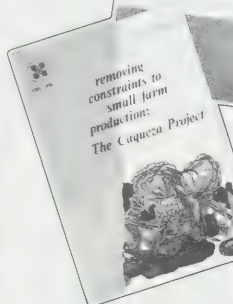
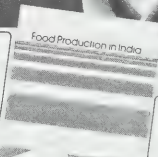
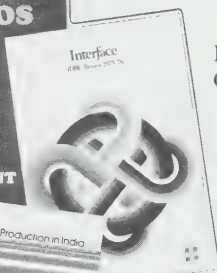
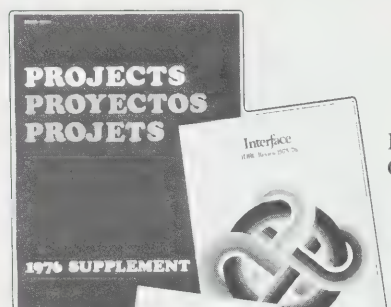
In a few brief remarks, Mr Head spoke of his pleasure in being accepted for the Presidency, and the anticipation he felt at the opportunity to return to the fields of international development and research.

Mr Head's appointment is effective 13 March, enabling him to attend the meeting of the Board of Governors in Colombo in his new capacity.

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

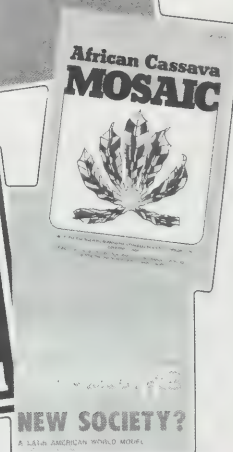
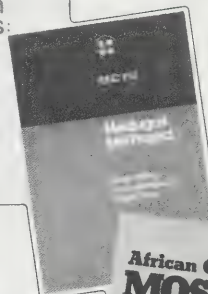
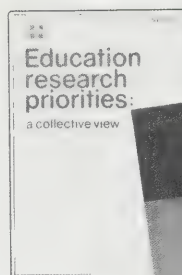
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In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population and health, information sciences, and social sciences and human resources. A list of past and current publications is available on request.

Distribution Officer,
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The IDRC Reports

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DOSSIER:
MEDIA & MESSAGES

Which doctor?

Babu-Edi, an unassuming middle-aged African wearing a green fez, matching pants and a bright patterned shirt, is President of the Matadi Healers' Association.

The Association which elected him has 152 members, a 14-member council, and like most such organizations is concerned with the betterment of its members and the maintenance of high professional standards. The difference between this and other medical societies is that these are not "doctors" in the Western sense of the word, they are what the West has mis-named "medicine men" or "witch doctors".

Matadi is a steamy port city of some 100,000 inhabitants in Zaire, and Babu-Edi is just one of thousands of healers in this West African nation who constitute a powerful health resource that is believed in and resorted to daily by Africans, but is not officially recognized by the state. He has his counterparts in every African country, and indeed in every country in the Third World. Collectively the healers practice what is referred to by international agencies like the World Health Organization as "traditional medicine".

Only recently have international organizations begun to realize the potential of traditional medicine in the Third World, and some of them are now taking steps to determine whether this valuable resource could not be better utilized. The IDRC has been a leader in this field, beginning with studies of the role of traditional midwives in Thailand as far back as 1972.

The WHO has now set up a Working Group on Traditional Medicine to foster such utilization, to explore its merits in the light of modern science so as to maximize useful practices and discourage harmful ones, and to promote its integration with modern scientific medicine.

Zaire is one of the leading countries in Africa in the new interest in traditional medicine. "You can consider Zaire as a little laboratory for all of Africa in this field," Gilles Bibeau, a Canadian anthropologist who headed an IDRC-supported research project there for the Zaire government, told me when I visited the country in 1977. And that is how I came to meet Babu-Edi and some of his colleagues. To do so, I travelled by Land Rover to Matadi.

In Zairean cities like this — and in smaller towns and villages throughout the country — the healers constitute a network of health "professionals" in whom the ordinary people believe implicitly. It is a network, however, that official bodies have until recently ignored and the medical profession has shunned. Yet in the whole of Zaire, which has a population of 25 million, there are only 1,100 medical doctors — 400 of them practicing in the capital city alone.

This lack of medical personnel is one of the chief reasons the Zairean government — like others — is re-evaluating traditional medicine. Cost is another: developing countries by definition are poor and do not have the resources necessary to recruit large armies of health professionals.

Zaire is attacking the problem through a study on how the healers operate, who they are, what plants they use in their herbal remedies, and what sort of success they have. Six hundred healers and 4,000 patients were involved in the study, whose final phase was completed late last year. A report written by the study group recommends how the government could integrate traditional medicine with modern medicine in the country's health services. This is the first national research program on traditional medicine in an African country.

David Spurgeon

An old man and his grandchild — nothing could be further from the conventional Western image of the "witch doctor", but that's what he is. More accurately, he's a traditional healer, known in Sumatra as a "dukun". He is one of several interviewed by David Spurgeon in Asia and Africa. In this article Spurgeon describes some of those encounters, and explains how the art of traditional healing has suddenly, albeit belatedly, acquired an aura of respectability in international circles.



Photos: D. Spurgeon

The dukuns first re-set the fracture, then put healing herbs and bandages on the limb. But there are stories, he said, of their setting the fracture at a distance, without seeing the patient.

A patient who had been healed that way said he remained at his own home while the dukun, who was somewhere else, pressed on a certain bone he held. The patient felt pain and cried out — but the fracture was healed.

I asked Dr. Effendy what he thought about this. "I don't know," he said. "I can't say I believe it or I don't. It's hard to understand."

The first dukun I encountered was at a small gathering of houses near a muddy river amongst the palm trees some 20 miles outside Medan. He was a Muslim, and he lived in a small, traditional Malay wood house on stilts. Aged 50, he had learned his trade from his father, and had been practising as a healer for 38 years. But he had not always been a healer. Before the Japanese occupation he had worked as an electrician in Medan. When the Japanese came, he was cruelly treated, and fled. He lived first as a farmer, then found people coming to him for healing, expecting him to heal because his father had. He sees sometimes up to 15 patients a day, spending an average of an hour with each. He specialized in fractures and massage, and his patients come sometimes from afar — one recently had come from Jakarta.

The researchers from the university who accompanied me told me that people often prefer to have their bone fractures set by the dukuns rather than in hospital, because they may stay months in hospital. With the dukun's treatment, a bone may heal in 10 days to two weeks. This corroborated what Dr. Effendy had said.

The second dukun we visited was described as a witch-doctor. He looked old (he was 68), was toothless, bowlegged and slightly crippled, and he lived with a former patient whom he had cured of witchcraft and who, in gratitude, said he would henceforth be his son and had the old man come to live with him.

The dukun was dressed in a fez, T-shirt, and blue pants — he looked like a wizened old grandfather, and in fact soon began to play with his son's baby on his lap, a far cry from the usual Western image of the witch-doctor! He had had two patients to visit that morning, one, a child, with a dislocation of the leg, the other, a woman with three children and pregnant again, who was possessed by an evil spirit.

The dukun treated the dislocation with massage, and, with the help of a midwife, treated the hexed woman by pronouncing an incantation as the midwife chewed the leaf of a plant which was then spit upon the woman's stomach, chest and back. The family was counselled to repeat this prescription three times a day for several days, and the healer went on his way.

The closeness of the traditional healer to the lives of the people he deals with is one of the most important factors in his popularity and success. This seems to be true throughout the world. Western medicine emphasizes the individual; most rural peoples emphasize the family and the community — and so does traditional medicine.

Dr. R.H.O. Bannerman, secretary of the WHO's Working Group on Traditional Medicine, himself a Fellow of the Royal Society of Obstetrics and Gynaecology and a graduate of England's St. Bartholomews and Hammersmith Hospitals, told me he has always believed that success would never be achieved by trying to push the Western model of medicine on the Third World. A Ghanaian who practised for years in his country before joining WHO 10 years ago, Dr. Bannerman told me in an interview in his office in Geneva:

"My country had Western medicine for 100 years before it became independent, and 20 years afterwards it cannot claim more than 25 percent medical coverage of its people. It's highly unlikely we can provide coverage worldwide by the year 2000."

The WHO has adopted the slogan, "Health for All by 2000", and Dr. Bannerman says if it is to be achieved, a re-orientation in thinking is necessary.



Researcher from North Sumatra University interviews an old man they call a "witch doctor". He is one of 15 healers being studied in an attempt to find out more about the effectiveness of the dukuns.

"Instead of talking strictly in terms of health professionals and auxiliaries we have to talk of all available resources that would be mobilized for health care."

On the question of integration of the various types of health services, he says: "It's essentially a political question. If you leave it to the professions you have this constant bickering as to who co-ordinates whom." As people develop confidence and mutual trust in one another this kind of situation will "quietly fizzle out," he believes.

WHO officials themselves had difficulty coming to terms with the question of utilizing traditional medical practice, Dr. Bannerman admits. And one of his old medical colleagues wondered aloud how someone with Dr. Bannerman's background could write as he has on the subject. Dr. Bannerman's reply: "Experience. Facing reality."

Portrait of a healer at work

During his visit to Zaire, writer Spurgeon was able to interview a number of healers, thanks to the help of the traditional medicine project researchers, and was even able to witness some of them at work. Here he describes one such encounter.

Butoyi spoke no English or French, so her replies had to be translated to me by the French-speaking researchers. At first she seemed a little ill at ease. She spoke a great deal about spirits presenting themselves to her, and when I asked how she had become a healer, she replied that she wanted to wait until the spirit answered.



Finance Minister de Mel welcomes the IDRC Governors to Sri Lanka. On his right is Board Chairman Maurice F. Strong, on his left IDRC's new President, Ivan Head.

year in a developing country. Statistics and reports were important, he said, but direct rapport with the people whom the IDRC was committed to support was even more important.

Earlier, Mr de Mel had been welcomed by Mr Strong, who spoke of Sri Lanka's "gift" to the Centre. Although the IDRC was a Canadian based organization, he said, its make-up was truly international. Sri Lanka had contributed her share to this internationalism, he added, by contributing two of her sons — Nihal Kappagoda, formerly Asia regional director, now Vice-President International, and Ernest Corea, a distinguished journalist who was now director of the Centre's Publications Division.

Towards the end of the meeting, Mr Head was invited to address the Governors. He spoke of his feelings of honour and excitement at being selected for the position of President of the IDRC, and referred to the long list of "incredibly complex yet awesomely basic" world issues in which the only common element was change.

Commitment to development, he said, was their common cause adding: "In my mind, the equitable resolution of the needs of the developing countries is one of the three most pressing, most important, and most complicated challenges facing our contemporary world. To be given the opportunity to join with others dedicated to that challenge contributes heavily to that excitement.

"I come to the task as a self-confessed optimist. I look at the past quarter-century and see that the average per capita income of the developing world grew at an annual rate of three percent, compared with the rate for the indus-

trialized countries for the same period of two percent. Average life expectancy has increased from about 40 years to 50. So successful have been the developing countries in reducing death rates that populations, as we know too well, have soared and introduced another problem factor.

"In the 25 years from 1950 to 1975, more people were added to the population of the developing world than the present total population of the developed countries. One cannot overestimate the severity of these facts, yet one should not underestimate the accomplishments — the absorption by the LDCs of 900 million persons in 25 years while nevertheless effecting a significant improvement in their standard of living.

"Optimism, of course, should never contest realism. Development among the LDCs has not been even. Almost one-half the developing world experienced a growth rate of only 1.5 percent over the past 25 years. And within individual countries, hundreds of millions remain largely outside the development process. These are not matters of statistics, they are issues of individual human beings — many of them children."

Mr Head also paid tribute to the "monumental contribution" made by W. David Hopper during his years as the Centre's first President. Dr Hopper had constructed not only an organization well-suited to deal with the innovative tasks given it in its statute, he had constructed what could rightfully be called "an innovative organization".

It was his intention, said Mr Head, to continue to encourage innovative attitudes, and he pledged a threefold thrust

to his efforts: "...to assure the continued independence of the Centre; to promote the professionalism of its staff and its activities; and to enhance wherever possible the effectiveness of its work."

During their three days of meetings, the Governors approved some 25 new projects, in addition to discussing policies and new directions for the Centre in the year ahead. Projects approved ranged from a program of radio schools in Bolivia, to a study of the impact of improved water supply, sanitation, and health education on the incidence of disease in rural areas of Bangladesh.

The meeting received extensive coverage in the local press, including this comment in an editorial from the *Ceylon Observer*: "We are sorry the IDRC is not better known to more people in Sri Lanka. The presence of the board of governors this week can help remedy that, for though Sri Lanka cannot ask for special consideration, disseminating the results of IDRC research will help bring benefits more effectively to the people."

And from the *Ceylon Daily News*: "The IDRC...is the first centre of its kind, and was established at a time when the importance of development research had not been fully grasped worldwide. It has developed a style of operations in which the priorities of developing countries are paramount. At a time when resources for development are scarce, we are sure that such an innovative organization can give us the lead in showing how best these resources can be utilized, and the North-South gap thus reduced."

In fact the problem is not that simple. It is considerably complicated by the country's uniquely varied soil and climate conditions — its agroecology. Scientists have classified the world's soils into 10 major types; nine of those 10 soil types are to be found in Sri Lanka. The island's annual rainfall varies from a soggy 250 inches in the south, to a measly 25 inches in the north. And unlike most of its Asian neighbours, Sri Lanka experiences not one but two monsoon seasons — the *Maha* from October to January, and the *Yala* from March to May — which give their names to the year's two rice crops. Finally there is the nature of the land itself, with coastal plains almost at sea level contrasting with mountains that peak at 8,000 feet, creating mini climate zones of their own.

All these factors combine to make Sri Lanka something of a living laboratory from the agricultural scientist's point of view. Which is where multicropping comes into the picture.

The acknowledged centre of expertise on cropping systems research in Asia is the International Rice Research Institute in the Philippines. Founded by the Ford and Rockefeller Foundations in 1962, IRRI is today one of 10 international agricultural research centres that are supported by a worldwide consortium of donor agencies, the Consultative Group on International Agricultural Research, of which the IDRC is an active member. IRRI was instrumental in developing many of the new high-yielding rice varieties in the Sixties, and has been engaged in cropping systems work for the past decade.

Today IRRI's cropping systems work is so widely accepted that it has become the centre of an Asian Cropping Systems Network, of which Sri Lanka is a member, along with Bangladesh, Indonesia, Malaysia, Nepal, Philippines, and Thailand. People working directly in national programs meet every six months to compare results and discuss mutual problems.

A major cropping systems project is currently underway at the Maha Illuppallama Agricultural Research Station in Sri Lanka. The project is supported by the Ministry of Agriculture and the IDRC, and it is of particular interest to the Asian Network because the wide variety of conditions found in Sri Lanka means the results of the research may be widely applicable in other Asian countries.

In cropping systems research the emphasis is on crops, but the keyword is systems. The goal is to make the most efficient use of the farmer's total resources — land, animals, water, and people. This is usually achieved by growing additional crops (either together or in sequence) and by increasing the yield of existing crops.

This is what is happening in the Maha Illuppallama project, which began in

1976. Around Walagambahuwa, an area where rice growing depends on irrigation from minor tanks, 45 farmers were selected to take part in the project. A similar number was selected in the Katupota region, where rice is grown under rainfed conditions and irrigation is not a major factor.

The development of cropping systems on the farms is important — systems that will work only under laboratory conditions will be of no use to the farmers. So the researchers spend most of their time out of the research station, working alongside the farmers in the fields. This way the farmer becomes a partner in the research: he supplies the land and most of the labour, and he is free to reject any idea that he feels will not help him, and to add his own suggestions.

This approach has practical value, but just as important is its psychological impact on the farmer. As W.B. Medagama, an extension officer with the Ministry of Agriculture, told participants at a cropping systems workshop in the early days of the project, the dry zone farmer has been viewed for the past 50 years as a "poor, miserable human being living in misery". The result was that the farmer felt he should get away from farming in order to be socially accepted. He was a farmer only because he had nothing better to do.

It was necessary, said Mr Medagama, not only to accept the dry zone farmer and give him pride of place in society. "The technology we preach and want them to adopt should be developed from within the resources available...with what resources the farmer is capable of acquiring and using," he said.

So the researchers are encouraging the farmers to try new methods. Dry planting of rice before the monsoon, for example, makes for better use of available rainfall than does the traditional method of simply waiting until rains have filled the ancient irrigation tanks to overflowing.

These tanks are the remnants of a remarkable irrigation system that once kept the northern part of the country green and prosperous. Years of war and successive colonial administrations led to neglect, however, and today many of the tanks are disused. Those that remain, or are capable of repair, could still play a vital role in a multicropping system. By speeding up the paddy cultivation and making better use of the rains, the water that collects in the tanks can be used for a second, even a third crop.

Careful records are kept of all the participating farmers' activities, and for comparison the researchers also monitor the work of a number of farmers in the same area using the age old traditional methods of paddy cultivation. At the Research Station the scientists experiment with short season rice varieties and varying combinations of crops to follow the rice harvest, such as chillies with soybean, black gram or groundnuts.

Another joint project of the Ministry of Agriculture and the IDRC began in 1977. It is designed to complement the cropping systems work already underway. With improved cropping practices comes the need for improved crops, especially in the northern dry zone. Traditional farmers in this area have for millenia practiced the form of shifting agriculture known as *chena* — but population pressures are rapidly making this relatively inefficient system both impractical and potentially destructive of the land. Shifting agriculture depends on long periods during which the land can lie fallow, allowing the soil to recover from a short period of intensive agriculture. If there are too many people then the fallow period becomes shorter, and the soil begins to deteriorate.

Mung bean, cowpea, black gram, and sorghum are among the most common crops grown under these traditional systems. So the aim of the food grain improvement project is to develop improved varieties of these crops that can be grown in rotation with the rice crop, encouraging a more settled and more productive kind of agriculture in the upland areas. The training of additional researchers in plant breeding techniques will also be an important part of the three-year project.

By participating in international networks for cropping systems research and sorghum and cowpea improvement, the Sri Lankan scientists are able to draw on the advice, experience and material available from other countries tackling similar problems. And the knowledge gained here in the "living laboratory" is passed on to other Asian scientists who are also working to provide more food for their people.

Says Mr E. Abeyratne, Director of Agriculture for the Department of Agriculture, "We are at the beginning of a change in our whole approach to agricultural development. What we are looking at here now is an attempt to bring all the resources together and make full use of these resources.

"This cannot be done without a complete team approach.... on the one side the understanding of the environment involving climatologists and soil scientists, and on the agricultural side plant breeders, agronomists, physiologists, and the whole works, all focussing in a given area."

Working together with the scientists, Sri Lanka's small farmers can not only regain their self-respect, they can help to reduce the amount of food that must be imported, and thus improve the standard of living of the entire population. □

It's not only what you say, it's also how you say it . . .

The world is no longer a very large place. Newspapers and magazines provide daily reports of happenings all over the globe, and by the miracle of satellite transmission millions of people on different continents can watch television as elections are won and prize-fighting titles are lost.

But if our world has become an electronic village, the majority of its inhabitants are still not connected to the system — in rural areas of the world there are precious few newspapers, fewer radios and hardly any television sets. There are also too many who have never learned to read, and too often the miracle of radio and television brings only trivia, or worse, to those few who do have access to it.

Yet communication is vital to development. Research results may be wasted if they are not passed on. Health and education can be transmitted to remote areas. And people can be made aware of how they can help themselves. Communication is a vital tool of development.

But communication is not easy. There are places in this world where a smile is interpreted as a sign of hostility. There are also places where a nod of the head means "yes" and others where it means "no". The difficulty lies in picking the right medium and the right message.

The Colombian farmer on the cover of this issue is fortunate — he can read, and he has a newspaper that addresses itself to his needs. The group below is making use of an inexpensive cassette tape recorder to exchange views and information with other communities (see article on p. 16).

On the following pages we offer a few more examples of other media and other messages in support of the development process. And if they provide food for thought, then we have...communicated.



JOURNALISTS AS PARTNERS IN DEVELOPMENT

Ernest Corea

note. The district officials visited Chhatera and construction of a regular concrete bridge was sanctioned. A year-and-a-half later traffic was moving across the new bridge. The Rural Housing Wing of the School of Architecture in Delhi helped design and build the school using cheap local materials, also motivating the villagers to collect contributions to raise it to a middle school. A group of young social workers from Delhi lived with the Harijans and helped rebuild their well and also a soak-pit near it.

Teams from the All India Institute of Medical Sciences and the Indian Agricultural Research Institute camped in the village and provided simple medicare and extension about new cropping patterns and farming practices. This was followed up through fortnightly visits for several years. A leading tractor manufacturer organised a Farmers Club.

Villagers from neighbouring areas came to see all this new activity. Our Village Chhatera had become a change-agent, and publicity an input in development. Villagers still tell visitors that until the *Hindustan Times* came, not even a political worker had visited to canvass for votes. But with the interest aroused by the newspaper there was a stream of visitors. The chairman of a national bank came and decided to open a branch which has since financed the purchase of 78 tractors, including some under a World Bank scheme, besides mobilising over Rs one million as deposits.

The Union Communications Minister came and gifted a part-time post office besides sanctioning a telephone connection for the village. The Vice-President came to inaugurate a Lions Club eye camp. The American Ambassador came to see how change was taking place in a village as a result of practical development communications.

One unique factor of project Chhatera was that neither the newspaper nor any outside agency spent any money. Mr. Verghese held that that approach had already been tried. In Chhatera only time and know-how could be given. It was impressed on the villagers that they must help themselves if they wanted to stand on their feet.

In February 1977 the newspaper dropped project Chhatera as suddenly as it had picked up the village exactly nine years earlier. But the villagers, banded together under the "Village Welfare Association", a registered society, are carrying on the work. Having joined hands with the National Dairy Research Institute and Action For Production, Chhatera is well on the way to ushering in a "White Revolution." □

Narendra Aggarwal, Staff Correspondent and Feature Writer for the *Hindustan Times*, New Delhi worked on project Chhatera under the guidance of the newspaper's editor, Mr B. G. Verghese.

When the IDRC's Board of Governors met in Colombo earlier this year, Sri Lanka's Finance Minister Ronnie de Mel told them "there is a case for bringing the discipline of research and the resources of the IDRC to bear on such 'non-scientific' subjects as...the role of mass media in developing countries." That same morning, the Ceylon "Daily News", commenting editorially on the Governors' meeting said:

"The results of research must be widely delivered, and their implications understood, if research is to be accepted and applied. We do not refer here to sophisticated electronic information systems...that have little relevance to most developing countries. Research results must get around, through simple but effective communication techniques, even if this means wall posters and news sheets."

By interesting coincidence, almost as if in response to the challenge, journalists from South Asia met in Colombo around the same time to work out, and work at, techniques for covering food and agriculture news, and more specifically, the results of foodag research. The workshop/seminar was organized by Sri Lanka's Ministry of Information and the Singapore-based Asian Mass Communication Research and Information Centre (AMIC), with the support of the IDRC.

This was the second in a series of foodag seminar/workshops organized by AMIC with IDRC support, and was part of a continuing effort to help journalists in developing countries to function effectively as partners in development with scientists, policymakers, and the people whose upliftment development is all about.

There are difficulties in this kind of reporting, not the least of them being perhaps the relative inexperience of some media people in developing countries. It is only fairly recently that publishers and others in the Third World have grudgingly conceded that newspapermen, broadcasters, and television staff need special training. Then again, pay structures, particularly in Asian newspapers, are such that the specialization is rare. Almost every Asian newsroom has a reporter on the agriculture beat, but few of them come to that position with anything more than a rudimentary knowledge of agriculture.

Yet, for Asian media to ignore foodag research is to ignore a factor crucial to the wellbeing of people. Studies have shown that many developing countries are capable of vastly expanded food production, given the correct use of food technology, and the required amount of political will. Fashioning that technology is the responsibility of researchers; adapting and using it is the responsibility of policymakers.

Some kinds of technology have infiltrated the villages including radio and a few televisions, but unfortunately not others, directly relevant to the lives and well-being of the people. Which brings me to my concern: How DO you take technology to a village?

For example, when water floods the ricefields of Kedah during the monsoon season, the paddies are chockful of *ikan sepat*. The fish can be scooped up for the asking, in net, can, wok, or anything else that is readily available; and because fish crops are so abundant farmers rarely get more than 20 cents a kilogram for their catch.

Comes the dry season, the waters recede, and the slithery, silvery fish that swam around in abundance not so long ago are nowhere in sight. No catch. No stocks. Farmers go into the nearest town to satisfy their wants and buy salted *ikan sepat* for almost \$2 a kilogram.

How can these farmers be convinced that salt is cheap, sunshine abundant, and that fish can be dried and salted and put away for dry days right in their own backyards? That is technology though, admittedly, of a very unsophisticated kind. The message gets more difficult as technology becomes more sophisticated, and transmitting this message is no easy task for there is a great deal of superstition, myth, and plain stubbornness to be overcome.

Journalists participating in an IDRC-sponsored foodag seminar in Bandung learned that Indonesia has achieved considerable success with rural radio broadcasts (mass media) and agricultural extension (intrapersonal communication). They heard, too, of the great job being done by Malaysian television's Development and Agriculture Unit and Pakistan's rural broadcasting program which receives an average of 10,000 inquiries a month from farmers.

There is much more to be done, however, if the enormous advances of modern technology are to be transmitted to the common people, understood and used by them, for their own benefit.

Communicators of different kinds — some of them having already benefitted from almost unbelievable advances in print and electronic media technology — can participate in this process. □

Medicine and more via satellite

Ron Browning

Photo: NASA

previous space communications device.

Telemedicine is perhaps one of the most immediately beneficial applications of communications satellites. The ability to provide health care consultation over distance, regardless of terrain or remoteness from centralized facilities, can help correct the lopsided distribution of medical resources in developing countries, now largely concentrated in urban centres and away from the majority of the population in need. As the story that began this article illustrates, telemedicine can support rural health care workers such as nurses and auxiliaries, providing access to physicians or diagnostic facilities.

Often, medical communications in rural areas are limited to persons passing through by vehicle (or by foot or animal in very remote and inaccessible areas). The level of care in these areas is limited to what the local health worker can provide alone, often with poor equipment and inadequate supplies, and little or no advice from trained supervisory medical personnel. At the same time, the local health worker has few opportunities for continuing education or advancement in the job. Vital statistics go unreported, further confusing the understanding of the health levels of populations. And in an emergency or epidemic situation, many will suffer because of the delay in communicating the information or treatment needed to take action.

The educational applications of a telemedicine system could be exploited to allow a practitioner to remain in the field while continuing his training, whether it be updating his knowledge of professional procedures or new drugs, conducting a crosscountry seminar on particular medical problems, or holding "university of the air" sessions for health workers.

Two-way radios for emergency medical communications are becoming more common in developing countries, but technological, economic, and administrative difficulties continue to restrict

their widespread use. The two-way radio becomes more versatile and valuable when there are enough relaying or broadcasting stations to form a network. Satellites provide an instant network as they do not depend on the ground structure of land lines or microwave towers to reach from cities to rural areas. The World Health Organization, as part of its appropriate technology for health program, has assigned priority to the need for communications for the health sector. It specifically suggests two-way radio and satellite communications as alternatives that developing countries might follow.

The economics seem right, especially in relation to the expense of expanding (or establishing) land-based communications systems. The benefits are particularly great when service must be provided to a population scattered over a large area, isolated by geography or distance. Indonesia, with its people spread throughout some 3,000 islands within a vast area of the Pacific Ocean, has its own domestic satellite. Algeria, Brazil, and Malaysia operate their domestic satellite systems through IN-TELSAT (the International Telecommunications Satellite Consortium) whose network includes 91 countries. Chile, Nigeria, the Philippines, and Zaire are planning domestic telecommunications systems using satellites.

Health care via satellite may never become as commonplace practice as the use of a stethoscope, nor as comforting as the "laying on of hands" by a human health worker. But in the search for ways to provide improved health services to the most people at the least cost in rural and remote areas in developing and developed countries, telemedicine may play an increasingly important role in future.

This article was prepared for IDRC Features, a monthly news service on science and technology as they relate to development. The service is available free to news media in Third World countries.

Making maps for development

After nearly five-and-a-half years of observing mineral deposits, crop conditions, water pollution, land use and other earth resource features from 917 km in space, LANDSAT 1 was retired January 16 by NASA (the US National Aeronautics and Space Administration). Since its launching in July of 1972, LANDSAT 1 had taken more than 300,000 pictures with its multi-spectral camera systems: photographs taken at four different wavelengths, which when resolved, provided scientific data for a systematic study of the earth and its resources and environment.

IDRC grants have provided training for researchers in Bangladesh, Bolivia, Mali, the Sudan, and Tanzania to exploit the data provided by LANDSAT's "photographic maps" in coordinating various programs involving resources, cartography, and regional development plans.

LANDSAT 2, launched in 1975, is still in orbit, and was joined earlier this spring by LANDSAT 3. LANDSAT 3 carries improved instrumentation, such as an added thermal infrared channel to provide more useful agricultural information on plant stress, vigour, and other changes characterized by temperature differences. Like its sister satellites, LANDSAT 3 is in a circular, near polar orbit 917 km above the earth. It circles the globe every 103 minutes, viewing a 185 km strip of the earth's surface, proceeding westward at a rate such that the entire surface is covered every 18 days. Improved resolution in LANDSAT 3's sensors makes it practical to study areas as small as 1.25 hectares.

LANDSAT 1 was designed with a life expectancy of only one year when it was launched in 1972, and according to Ron Browning, NASA's LANDSAT Project Manager, the spacecraft "more than achieved its goals, in fact, beyond any stretch of the imagination." A still more advanced LANDSAT is being developed for possible launch from the US space shuttle craft, and the possibility of mounting repair operations from the space shuttle could extend the life of the previous satellites in the series. □

presented, and then try to put it into practice. These programs are participation-oriented, but the problem is to get audience reactions. The people are often unable or unwilling to express themselves in written form, so the feedback, if any, is usually poor. The solution is the cassette recorder, which can not only carry and transmit the message, but also record answers and audience reactions on the same tape and return them to the broadcasting centre. The cassette recorder is lightweight, inexpensive, easy to operate, and flexible. It can be listened to as often as required, and at any hour. Thus, at a distance, a dialogue is set up between broadcasters and listeners, resulting in communication in the true sense of the word.

The participating groups in the Uruguay experiment belong to CALFORU, a successful central cooperative that has produced great economic benefits for its associates and exports a considerable amount of farm produce. CALFORU offers its members all the benefits of a cooperative program: credit, technical assistance, commercial markets, and good prices through direct sales which skip "middle men". Its weak point has been the limited amount of effective member participation. These people have usually had little or no involvement in the decisions which concern them. They are not accustomed to participation.

At present 12 groups of farmers take part in the experiment, each with its own trained coordinator. Each group meets regularly for a "producers' round-table" and to hear recorded programs on aspects of their cooperative organization. Each records its answers on the same tape and returns it to the central broadcaster, who includes these answers, in the participants' voices, in the next message to all the groups. Thus each group hears and learns what the other 11 groups think. "Farmers have a long-distance dialogue in their own language," says Mario Kaplun. "In our experience as communicators we have never had such rapid and active feedback". It fact most of the topics already come from the participants themselves.

An unexpected residual effect has been seen in the central office of CALFORU. Its administrators and officials are themselves encountering for the first time basic realities through the cassettes — the method is educational for administrators as well as for farm producers.

What these projects demonstrate above all is the importance of communications in rural development programs. Given the difficult conditions of the rural Latin American environment, the use of electronic media and of group communication techniques represent perhaps the fastest and most economical solution available to these countries. □

This article originally appeared in Spanish in CIID Informa Vol. 6 No. 3. Susana Amaya is Associate Director, Publications, in the IDRC's Regional Office in Bogota, Colombia.

Getting research to the farmer

A research paper may represent years of painstaking work, an investment of thousands of dollars, and the potential for important advances in technology. But if the paper is not widely distributed all that will be largely wasted. Worse still, time, money and effort may be spent on duplicating that research elsewhere.

It was to prevent this kind of waste that AGRIS was created. An international information system for the agricultural sciences, AGRIS is the hub of a worldwide network of regional and national centres that collect and disseminates tens of thousands of pieces of information every year.

The working of this system is illustrated in a new IDRC-produced film, *Thought for Food*, which examines the role of one of the regional centres — AGRINTER, the Interamerican system for the agricultural sciences, serving Latin America and the Caribbean.

The film begins and ends with Camilo Montanez, a small farmer in Colombia.

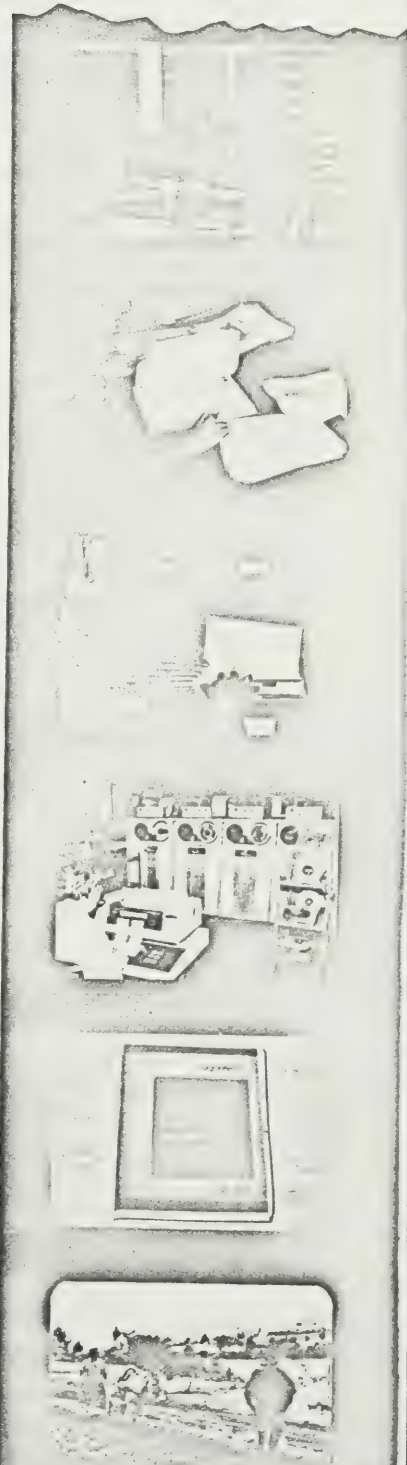
Ultimately it is the small farmers of the world like Camilo who should be the beneficiaries of such a system. Regional networks on the AGRINTER model provide an essential link between the scientist and planner on one hand and the farmer and the extension worker on the other, a link that ensures the results of agricultural research can be put to good use, not simply stored for posterity.

From the farm the film traces the growth of the network through more than 20 countries to the regional headquarters in Costa Rica, and on to the AGRIS centre at the headquarters of the UN Food and Agricultural Organization in Rome. Here the information is recorded and processed, and then made available to scientists around the world.

The cycle is completed when the extension worker returns to the farmer to help him apply new techniques to improve his standard of living.

Thought for Food was filmed and produced for IDRC by Neill McKee, and is also available in Spanish under the title

Vinculos para el desarrollo. For information on loans or purchase, contact IDRC Audiovisual Unit (Films), P.O. Box 8500, Ottawa, K1G 3H9, Canada.



Less waste, more food

Michelle Hibler

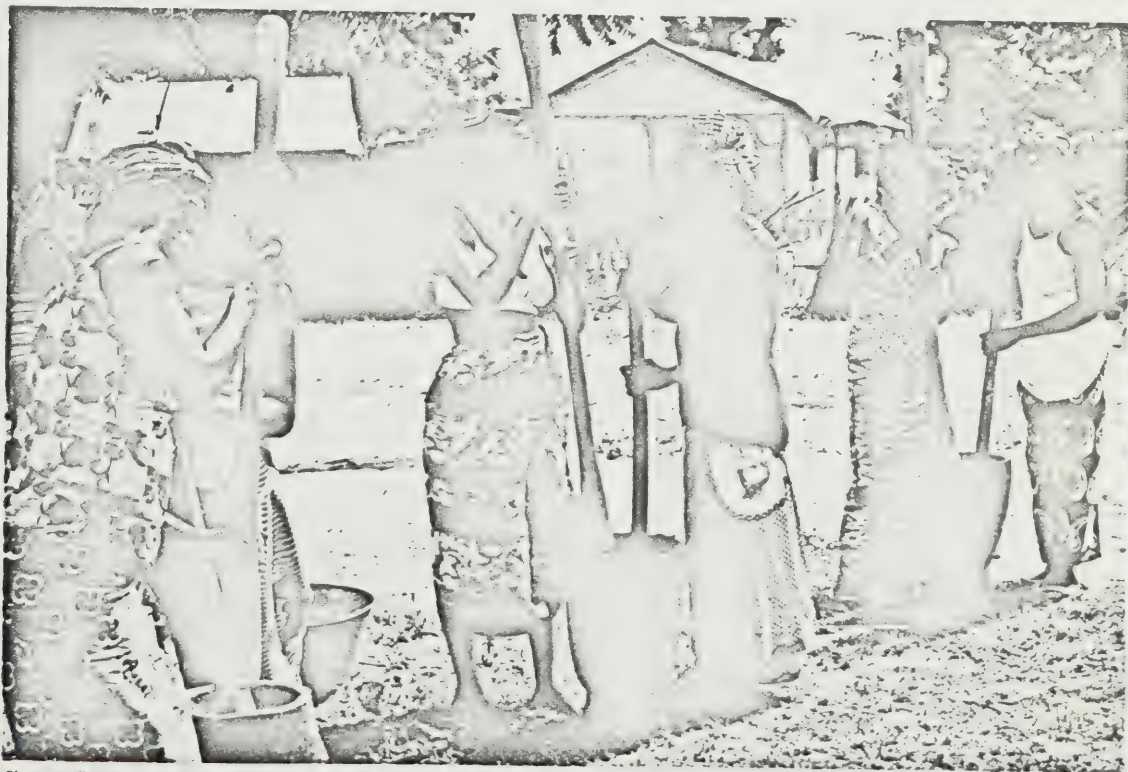
Cereals and grain legumes, the primary foods, provide a large part of the calory and protein needs of the people of Asia, Africa and Latin America. By 1985 the projected demand for cereals in these developing regions is expected to reach 929 million tons. If present trends continue, however, production will rise to only 853 million tons.

How can these countries counter a cereal deficit of 76 million tons? Increasing production is obviously one way and a great deal of effort has been made in recent years to do just that. But, despite the development of new grain varieties, new cropping systems, more efficient fertilizers and pesticides, production has increased by less than three percent annually when a four percent increase would be needed.

There is another, complementary, way: the better conservation and use of present crops. It is estimated that in developing countries as much as one-quarter to one-third of the cereal and legume crop is lost as a result of inefficiencies in the post-harvest system — from harvesting through processing to use in the home.

If these losses could be reduced by half — the target set by the UN General Assembly in 1975 — it would be equivalent to an increase in supply of at least 85 million tons of cereals (assuming losses of 20 per cent), an amount equal to projected imports of developing countries for 1985. If similar reductions in losses of legumes were achieved, at least 10 million tons of these protein rich grains would become available.

Below: Senegalese women processing millet the traditional way — it is back-breaking, tedious work, and not very efficient.



Photos: Neill McKee

and reducing the region's dependence on expensive imported wheat.

With IDRC assistance the Nigerian government has now launched a study of the possibilities of establishing similar mills throughout northern Nigeria. Recently, the Home Economics Division of the State Ministry of Natural Resources has disseminated the tested recipes and a booklet is being prepared for schools and extension workers.

At about the same time as the Maiduguri Mill was being set up, Senegal was beginning a large-scale program of sorghum breeding, intercropping and preservation. Carried out by the Centre national de recherches agronomiques (CNRA), the program sought to improve the existing varieties of sorghum and introduce the better varieties to rural communities together with appropriate management practices in mixed systems with millet and cowpeas.

The second component of the program was to improve the drying, storage, distribution and utilization of the crops, a problem that had been largely neglected but would become all the more important as the new, higher-yielding varieties were adopted by the farmers.

The CNRA team, headed by Dr Gordon Yaciuk, a Canadian agricultural engineer, tested various grain storage bins. They found that with good management, and when filled with well dried grain, slightly modified traditional structures made of woven branches or sorghum stalks were as efficient as elaborate concrete or metal silos, and much less expensive. But because these had to be relatively small to be manually filled and unloaded, they designed a partitioned silo made from local flat bricks that is suitable to cooperative village storage.

If silos were adequate, the practice of drying crops in stacks in the fields was not and storage losses resulted from the poor quality of the grain. Trials were carried out to use solar and wind energy to their maximum. The researchers determined the angle of the sun for every day of the year and the direction of the prevailing winds. They then built simple platforms, oriented so that the heads of the grain face into the wind. What they, in fact, produced was a simple solar cross-flow dryer that significantly reduces grain moisture.

A survey had shown that local women spend up to six hours a day decorticating and grinding cereals for their family's meals, a task they were increasingly resenting. If women were freed from this task, Dr Yaciuk reasoned, they would have more time to devote to other activities such as gardening and poultry-raising. The dehuller that proved so successful in Maiduguri was tested at CNRA along with a small locally manufactured cone style dehuller.

The findings from the first phase of this project are now being tested in two villages, one a community of about 50 families using the small cone style

dehuller, the other a large village where a cooperative system will be introduced, using a dehuller similar to the one in operation at Maiduguri.

The example set at Maiduguri and in Senegal did not go unnoticed. At the 1975 meeting of the Commonwealth Ministers of Agriculture, the government of Botswana, among others, expressed interest in the success achieved at Maiduguri in dehulling sorghum. The major technical problem in the development of a small scale milling industry in Botswana had been removing the pericarp, or husk, from the sorghum grain immediately prior to its milling. Failure to do so resulted in a discoloured meal with a bad taste.

The people of Botswana consume about 80,000 tons of cereal grains a year, mainly sorghum and maize. Conditions in the country are particularly suited to growing sorghum but although maize is only grown in the south, there has been a shift in recent years by consumers in favour of maize, most of which is imported from South Africa.

The major reason for this shift is that industrially milled, pre-packaged maize meal has become increasingly available. A second reason is that the price of maize is subsidized to South African consumers, who include Botswana in their marketing system. As Botswana lacked storage facilities, most of its sorghum crop was exported to South Africa, only to be reimported later on during the year, at higher prices.

In remote areas transportation also presents such problems that sorghum prices are depressed to the point where crops go unharvested in the fields. Farmers with stocks of unsold grain following a good harvest often fail to plant the following year. In 1975 this resulted in the harvest dropping to one-third of the previous year's production.

The Botswana Agricultural Marketing Board (BAMB) was created in 1974 to solve some of these marketing problems. Storage facilities were their first priority and facilities are being built at key locations along the main rail line and in villages. BAMB is now competing with South African purchasers for the sorghum harvest.

As a complement to these efforts, BAMB requested IDRC assistance to develop a small scale sorghum milling technology to produce sorghum meal at the village level, at prices comparable to those of maize meal. By providing a market for the sorghum crop, the farmer would receive a better price and would be encouraged to produce more.

The pilot mill was set up at Pitsane, a small village in a major grain growing area in southeast Botswana, located on road and rail lines to the urban northern areas. The mill uses the equipment developed through the projects in Nigeria and Senegal and includes two dehullers, one hammer mill and a packager.

A consumer preference study carried out while the mill was being installed showed a good potential market for the meal and detailed the product requirements. The mill went into operation last November: a test market of the products met with unexpected success, with demand soon outstripping the available supply.

Quality control tests of the mill's products will be carried out during the next few months and the Botswana government will test the products in other areas.

These projects and others in Asia and Latin America draw on a wide range of disciplines — engineering, food science and technology, nutrition and household sciences — in a concerted effort to improve the post-harvest system of the people's staple foods. The benefits of such an integrated approach are numerous: losses and spoilage are reduced, the nutritional quality of the foods is increased. By providing a market for the crops and making them more consistently available, it discourages cycles of surpluses and deficiencies and the resulting fluctuating price levels. It can also lead to the establishment of new industries and increase employment opportunities. More important, it can provide a stimulus to local grain production and utilization and reduce dependence on imported cereals. Improving the post-harvest system is not simply a matter of reducing food losses: it is increasing the food supply. □

Simple drying racks built from local materials at CNRA in Senegal — angled to take advantage of the prevailing winds, they dry the millet fast.



It is perhaps this debilitation that is the disease's greatest toll. The social and economic burden that is produced when millions are incapacitated and unable to work in fields, factories, or homes is enormous. It represents a major obstacle to development, one that impedes every effort to improve well-being.

The best hope for controlling bilharziasis may be in breaking into the life cycle of the parasite at some point to destroy it. There are three major species of *schistosoma* (The disease is often called schistosomiasis.) that infest humans: *Schistosoma haematobium*, *Schistosoma mansoni*, and *Schistosoma japonicum*. The male schistosome is a flat worm about 1 cm long, the sides of its body inverted to form a groove in which the female is carried. After mating the pairs move to the veins of the bowel (in the case of *S. mansoni* and *S. japonica*) or the bladder (*S. haematobium*). The females periodically leave the males and deposit eggs in the small portal veins in these areas. Most eggs penetrate the walls of the veins: some become trapped in the tissues there, scarring and hardening it. Others work their way into the bladder and bowels and are eliminated. Eggs eliminated in the urine or feces must reach water to survive.

Once in water, the eggs split and the larvae (known now as miracidia) penetrate the bodies of freshwater snails, which then become the intermediate hosts. Inside the flesh of the snail host the miracidia develop into a type of reproductive cyst. Some weeks later, depending on the species, these cysts produce numerous minute free-swimming larvae called cercariae. In this tadpole-like stage, the parasite swims vigorously upwards and drifts downwards in the water, searching for its principal host...humans.

After contact with the human host, the cercariae penetrate the skin (shedding their tails in the process) and move through the lymphatic system to the arteries, through the heart and lungs, and eventually appear in the liver. The complete process is not yet understood. The larvae grow rapidly in the blood vessels of the liver, then migrate to the bowel or bladder. There the mature worms mate and begin laying eggs.

Egg production usually begins about 40 days after penetration of the skin. The female can lay hundreds (and in the case of *S. japonica*, thousands) of eggs per day. Infection has been known to last as long as 28 years, although it is generally of much shorter duration.

Bilharziasis is primarily a rural disease. The snails that transmit it prefer slow-moving or still, shallow water. The shores of lakes, ponds, streams, swamps, irrigation waterways, and rice paddies are their habitat. Thus, farmers who work their land with irrigation, women who wash clothes at a stream or pond, and children who play along the shorelines of lakes and canals constantly risk

contracting the disease. It is an everyday sickness, tied to normal human activity.

The situation is unfortunately complicated by poor sanitation practices — schistosome eggs are transmitted when people urinate or defecate in or near water, or when wastes are disposed of in water. Often the body of water contaminated in this way is the only source for cooking, drinking, bathing, laundry, and agricultural needs in a community. A vicious cycle of infection and reinfection forms from water use patterns.

In attempting to control bilharziasis, health workers have taken a number of approaches. These include preventing human contact with infected water, controlling the snails that act as intermediate hosts, preventing the eggs from reaching pure water by improved sanitation, and by working toward the treatment of all human cases of the disease to eliminate its source. A combination of these methods is most likely to be successful, but to date a great deal of effort has been concentrated on the eradication of the snail host as the most effective means of breaking the disease cycle.

The damassissa weed Dr. El-Sawy is experimenting with is common throughout Egypt and the Mediterranean, and has had a place in folk medicine in Egypt for some time. Taken as a tea, it is held to be beneficial as a stimulant, an aid to digestion and the heart, and in eliminating kidney stones. However, if Dr. El-Sawy's hypothesis is correct, damassissa may have a much greater impact on health when applied externally...in waterways to kill snails.

The plant produces a powerful molluscicide in its leaves and flowering tops. Under laboratory conditions, infusions of 1:1000 part damassissa to water effectively killed all the common snail hosts of bilharziasis exposed to it. The plant's potency lasted two days, and also had a lethal action on the eggs and larval stages of the schistosome parasite. The active snail-killing agent of the plant is water soluble, and therefore does not have to be extracted by any special process.

Dr. El-Sawy's research suggests that farmers need only grow damassissa along the banks and shores of waterways, and when the plant matures and flowers, simply bend or cut them into the water. The weed is thus a cheap molluscicide that is safe to handle, has an established place in the local ecology, and does not appear to have any harmful side-effects on either fish or livestock. It even matures at an opportune time during the summer, coinciding with the peak snail breeding period.

Dried damassissa appears to be as effective as the green plants themselves, and remains potent for several years. If establishing damassissa (which is, after all, a weed) along irrigation systems where it might possibly compete with food crops should prove undesirable, then it could be grown at a distance on

separate lands, dried, stored, and applied as needed.

A preliminary field test involved submerging cloth bags containing 200 grams of dried damassissa every 10 metres along both banks of a 500-metre length of canal. One week later, the downstream snail population had been reduced by 60 percent, two weeks later by 97 percent, and by three weeks, virtually eliminated. The molluscicidal effect continued for about eight weeks, after which snails washed down from the untreated upstream portion of the canal began to repopulate the cleared section.

When compared to the other methods of control of bilharziasis, the use of damassissa seems very attractive. The Chinese have enjoyed considerable success in their campaign against the snail hosts, achieved largely through the mobilization of a massive workforce to dig out and clear waterway habitats and destroy the snails. Chemical means are expensive and often toxic, both to humans handling them and other — beneficial — lifeforms living in or using the water.

Establishing improved sanitation and water supply systems is a major development goal in itself: certainly the permanent elimination of transmission routes of the schistosome eggs will be one of the benefits such programs will eventually bring.

There are no effective means of providing mass treatment of bilharziasis. The available drugs are not efficient, they tend to have harmful side effects and are difficult to administer. The prevailing rate of cure is only 20-40 percent, while relapses and reinfection are common. Recent research in the UK has uncovered a promising lead in the development of a potential vaccine, involving a type of human blood cell known to increase in bilharziasis sufferers, but the possibility of any sort of mass immunization is still a very long way off.

Using damassissa to control the snail host of bilharziasis offers a more immediate, inexpensive, and elegantly practical method of attacking the disease. If Dr. El-Sawy and his colleagues establish that the plant can adequately fulfill this promise, then perhaps there is a very real chance that millions of people will be able to free themselves of a health burden that has already weighed too long on them. □

put into the earth and the ovaries were string beans that opened and dropped their seeds when ripe. From then on Dr Flavie's presentation changed drastically.

Working with the Philippine Rural Reconstruction Movement, he, and the villagers, have evolved hundreds of agricultural parallels: spacing children and corn; mother hens with too many chicks and mothers; stones placed on seeds and luds.

These analogies have now been published in the form of flipcharts by the Communication Foundation for Asia: one side depicts the natural phenomena, the other the family planning parallel. The comparisons are grouped into categories to allow for cultural differences between communities and relate to fishing, various types of agriculture, popular benefits and household articles. A manual, *The Agricultural Approach to Family Planning*, has also been published and is available, free of charge to developing country researchers, from Family International Assistance in New York.

CALLING ALL AFRICAN FORESTERS

African foresters, as a rule, are poorly informed about forestry research and development in African countries other than their own, despite the fact that many share the same problems. The lack of communication across national boundaries and language barriers is a serious obstacle to forestry development and can result in costly and unnecessary duplication of research.

To breach the communication gap, Gunnar Poulsen, senior research advisor in charge of a cooperative forestry research project at IDRC's Nairobi office, has launched a quarterly newsletter, *Sylvia Africana*. Initially it aims to increase information exchange and cooperation between the 20 or so forestry projects supported by the IDRC in Africa. In the longer term, Mr Poulsen hopes to stimulate forestry development by establishing an information network linking all forestry researchers in Africa.

The first issue, published in March in separate French and English editions, contains articles on the use of fodder trees in India, fencing in arid regions, and a new forestry project in Malawi, as well as reviews of new publications and an editorial. Contributions are requested from researchers in Africa and elsewhere working in the field of forestry and land use. Reviews of relevant books are also welcomed.

Requests for subscriptions and contributions should be addressed to Mr Gunnar Poulsen, IDRC, P.O. Box 30677, Nairobi, Kenya.

Viewpoint

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada, K1G 3H9.

I have just gone through your article — Good libraries and trained librarians are vital to development (*Reports* Vol. 6 No. 3).

It was very interesting that you should raise issues which are currently very topical in our own Kenyan situation — legislation for libraries, archives and training of information specialists as it influences their eventual career development.

Your views are widely shared by members of the profession here. It is now our belief that we should arm ourselves with very strong inter-disciplinary training to allow us not only to fight successfully for library, archives and documentation development but also to ensure an easy shift when one reaches the top to administrative jobs.

Ojwang Agina
Assistant Librarian
Centre for African Family Studies
Njoro, Kenya.

Daniel Hillel's "Case for conditional optimism" (*Reports*, Vol. 6. No. 4) provides a refreshing counterpoint to the more fashionable cries of doom and gloom that assail us from all sides. Certainly this is an age fraught with perils, and new ones are added it seems almost daily (now we must even worry about space junk falling on our heads), but it is nevertheless a better age in many ways than any to be found in the history books.

The "great ages" of the past were also times of pestilence, war and suffering, in which life for the great majority of people was apt to be short and brutal. Mankind may still have a long way to go, but he has made great strides along the road to a secure future.

Hillel's message is clear: there are solutions to all of today's "insuperable" problems; mankind is not doomed if only he will seek out these solutions and apply them diligently in the name of future generations. What is sadly lacking is the will to succeed, the sort of collective will that can make orange groves bloom in the desert or turn resource-starved Japan into a major economic power. The Western world, it seems, has lost faith in itself. Perhaps it is now time for the Third World to show by example what can be done, to provide the "new approach" that as Hillel says is so urgently needed.

A.K. Singh
Ahmadabad, India

The article on cassava toxicity (*Reports* Vol. 7 No. 1) gave the unfortunate impression that the situation in Zaïre was a generalized one. In the penultimate paragraph it states that the potential impact of the findings relates to the state of health of vast populations; and the final paragraph begins "If the goitrogenic effect of cassava, demonstrated in Zaïre, is confirmed in other tropical regions..."

The fact is that we have here a rather unique localized situation in which there are contributory factors which we are totally unaware of. This is not to say that the Zaïre problem is not an important one, nor to imply that the work of Délangue is anything less than brilliant. However, I have been involved in the cassava toxicity story since 1971, and have followed the work extremely closely. At the same time both the Belgian team and I have combed the cassava literature and I have talked to cassava workers and doctors all over the cassava-producing part of the world. To date we have absolutely no evidence of high cassava consumption being related to thyroid problems in man outside of Zaïre.

This statement is valid even though people in other countries eat as much cassava as they do in Zaïre. The condition in Zaïre is so dramatic and so horrid that, were it widespread, I have little doubt that we would have heard of it in other countries by now.

Barry L. Nestel
Redhill, Surrey
England

(Dr. Nestel, former Associate Director of the IDRC's Agriculture, Food and Nutrition Sciences Division, was responsible for the Centre's support for cassava research for some six years.)

"Who selected this technology?" asked a colleague after he heard a description of the problems being encountered with conventional manual cast-iron pumps in a country where reliable estimates indicate that 80 percent of the 50,000 wells in drought-prone, hard-rock areas were not producing any water because the pumps had broken down. A dictionary defines "select" as "exclusively or fastidiously chosen, often with regard to social, economic or cultural characteristics." The only reply I could give to his question is that no-one really selected the technology. It was grabbed from the inventory of machines most familiar to the engineers in the field.

Being wrong is a creative part of the learning process and we have a great deal to learn from the experience of the last two decades. But do we have an effective learning situation? As things now stand, the best information is carefully stored away in confidential files or even more inaccessibly in people's memories. Very little useful information has been published and it is unlikely that much more will be generated until there is a declaration of a "freedom of information act" in the rural water field. The time has come for everyone to admit that the last two decades have been largely experimental and that many of the experiments have been less than successful. If we can all agree that we are in the same leaky boat, we can begin to work out a system for problem-solving.

One of the most essential tools will be an effective system for the generation, collection and dissemination of information. Information in itself is silent, however. It is the use to which it is put — inferring, interpreting, projecting, analysing and decision-making — that is important. The development of an effective system for conveying the information to policy-makers and planners who are allocating scarce resources in the water field is one of the most challenging tasks facing those who are concerned with improving the situation.

Based on our observations of the shape of the past, IDRC has decided that resources must be allocated to solving some of the basic problems in the rural water technology field. Some of the basic criteria for our programs are: my technology must be capable of fabrication, as far as possible, within the developing country: it must be reliable, have a reasonable cost, and should be maintainable by the villagers. It is not a matter of designing technology for traditional society, but designing technology in collaboration with traditional society.

Getting this technology into the marketplace after the design has been tested and optimized presents great difficulties. Opinions vary as to the most effective way to do this. Some contend that the industrial sector has very little to contribute to the development of more appropriate technology for developing countries. Others feel that, with some encouragement, industry can make a significant contribution.

While our major emphasis should continue to be to encourage the development of local capacity for technological innovation, we should not dismiss the potential role of the industrial sector which already plays significant role in the application of technology in the rural sector.

An OECD publication states that, in 1975, \$5 million were spent worldwide on all research and development for appropriate technology; \$60 billion were spent on developing new technologies for industrialized societies. It is clear that more money must be provided, but that is only part of the solution. More effective mechanisms for the allocation of this money must be devised if it is going to be accessible to the innovative people in developing countries.

We don't fly in airplanes that have a 50 percent failure rate. Villagers don't want machines that break down and cannot be repaired. The challenge before us is to establish a system that will produce machines that will make poor people more productive — machines that will work, will last and are affordable. In developing this system we must ensure that the villager becomes an active member of the research team. For it is the villager who is the focal point of all this activity, and ultimately it is he who will judge if we are making a serious effort to solve his problems, or if we are merely continuing to tinker with his future. □

New Publications

Rural Health Needs, Moin Shah, Mathura P. Shrestha and Marilyn Campbell, editors. Published April 1978, 64 pages, IDRC-105e.

The Nepal Health Manpower Development Research Project began in 1973 to collect information useful for health planning and the development of training programs. In October 1977, representatives of five other Asian countries were invited to a seminar to share their experiences in health care delivery and learn of the Nepal project. This report of the seminar summarizes the results of the studies carried out in one district of Nepal, presents country papers from Nepal, Afghanistan, Sri Lanka, Thailand and the Philippines, and contains an annotated bibliography and list of participants.

Biogas Technology in the Third World: A Multidisciplinary Review, by Andrew Barnett, Leo Pyle and S.K. Subramanian. Published June 1978, 132 pages, IDRC-103e.

Biogas technology represents one of a number of village-scale technologies currently in vogue among governments and aid agencies. Because the technical and economic evaluation of these technologies has often been rudimentary, the IDRC commissioned this "state-of-the-art" review to form a basis for further discussion. The book's three chapters deal respectively with the technical aspects of biogas production, a social and economic appraisal, and practical field experience in six Asian countries.

Publications, 1978.

This up-dated IDRC publications catalogue contains a complete list of monographs, technical studies and audiovisual productions produced by the IDRC in English, French and Spanish as well as a list of forthcoming publications.

Information Retrieval and Library Management: An Interactive Minicomputer System, by Faye A. Danieluk. Published May 1978, 16 pages, IDRC-TS14e.

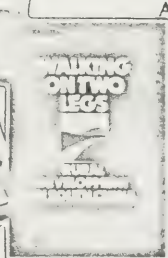
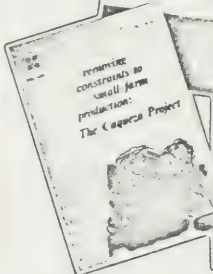
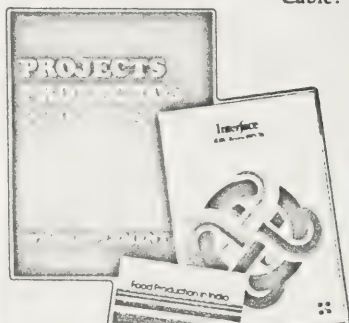
This booklet describes the IDRC's minicomputer-based bibliographic information processing system. Developed by the Centre over the past two-and-a-half years, the system was designed to meet the needs of many developing and developed countries for a low-cost system that will enable them to participate in international science information systems.

For information on these and other IDRC publications see announcement on the back cover of this issue.

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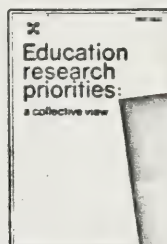
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In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population and health, information sciences, and social sciences and human resources.

A list of past and current publications is available on request.

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NEW SOCIETY?



Water technology — there must be a better way

David Henry

David Henry is Assistant Director of IDRC's Health Sciences Division. This article is based on a paper he presented to a workshop on "Water Related Problems in Developing Countries," organized by the Scandinavian Institute for African Studies. The theme was struck when he told the participants: "If the airplanes in which we travelled to this meeting had the same failure rate as most of the technology that has been applied in the last decade in rural water programs, 50 percent of us would not have reached our destination."

"Weapons determine tactics, tactics do not determine weapons". So said Hannibal about war. It could equally well be applied to describe some of the conceptual problems that exist in the field of rural water technology.

At present there is a strong trend among international and bilateral organizations to produce grand strategies for meeting the water problems in developing countries. The problem with these grand strategies is that they are often based on limited knowledge and experience on the ground. This confusion is compounded by the fact that both the tactics and the weapons for implementing the strategy are inadequate.

Looking at the past 20 years, we see that the major impetus for development agency involvement in the rural water field came from severe droughts, first in India in 1967 and then in the Sahel. It has been, in many respects, a response to a crisis situation, resulting in the injection of some very sophisticated capital-intensive equipment and expertise. From my observations I would suggest that the return on these investments has been very low, not only in purely economic terms, but also in response to the basic question: "Are these water systems producing any water?" If so, how much, for how many, and at what cost?

Many of the program officers in bilateral and international organizations who are responsible for country programs admit that there is a great weakness in the planning and field implementation of water projects. However, they are quick to point out that this is because their performance is often judged on the basis of the financial magnitude of projects rather than on the quality and effectiveness of the programs. Also inherent in the process is a heavy bias towards sophisticated equipment. It is far easier, for instance, to deal with a program requiring \$3 million worth of drilling equipment than it is to assist a country to plan and design a water project based on local labour and a blend of technology that can be sustained by the local economy.

We must realize that many of the people engaged in rural water projects in developing countries are products of highly structured and specialized training programs, designed to produce engineers and technicians whose role is to plan, implement and maintain urban water treatment and distribution systems in industrialized countries. This background,

when transferred into the extremely different environments in rural areas in developing countries, often leads to the imposition of a technology that has little relevance to the local situation and cannot, in most cases, be sustained by the local people after the expatriate engineer has departed.

When it comes to water supply, rural people have the cards stacked against them. They are on the fringes of the formal political power structure and do not have a revenue collection system through which payments for both capital and operating costs of rural water supply programs can be collected. This situation does not appeal very much to lending agencies. But the observation that rural populations do not produce revenue is not only naive, it is totally wrong. Developing countries have predominantly agricultural economies that stand or fall on the production of surplus agricultural products for export. Not only that, rural areas feed the cities and, in one country, a study showed quite persuasively that the villagers are subsidizing major urban water programs.

One of the most glaring weaknesses in the rural water technology discussion thus far has been that women have not been encouraged to participate in the dialogue. Women carry almost all the water used for domestic purposes and in many cases, spend more than half their time doing so. This is a tremendous waste of time, energy and resources. While it may not be possible to put a monetary value on the time and labour saved when water is made more accessible, one can say with assurance that until this obstacle is overcome, it will be difficult for rural areas to achieve a significant breakthrough in agricultural production.

Another limitation within international and bilateral institutions is the tendency for general program managers to take refuge behind the statement: "I am not a technical man". It will become increasingly necessary for the generalist to acquire a much better understanding of the technological implications of the decisions that are being made.

The best definition of technology for these purposes is "the totality of the means employed to provide objects necessary for human sustenance and comfort". It is a complex blend of social, technical, economic and political forces. In many cases, the technology problems we are facing can be traced back to the very limited perspective that many people have used in defining the term.

An expatriate technician in Africa recently described his work in the appropriate technology field as being primarily involved in "downgrading obsolete technology so that it will fit here". I regret that my observations in the field indicate that much of what is being described as intermediate or appropriate technology falls into this category. No criteria or objectives are defined for the research, no performance criteria are established for the machines being produced, and no critical evaluation or field testing is carried out.

BRIEFS

BANANAS COME HOME TO ASIA

Bananas are an important staple for many people in the tropics, and next to citrus fruits are the most important item in the international fruit trade. Bananas will be returning home to Asia as the Philippines becomes the new focus of a global program of genetic improvement for the *Musa* and its popular fruit. Bananas are native to the India-Malaysia region, although today the largest producers and exporters of the fruit are in Central America.

A meeting in Rome last year under the aegis of the International Board for Plant Genetic Resources brought together the world's top banana researchers, who recommended the establishment of a banana and plantain genetic bank in Southeast Asia. Participants at that meeting had expressed concern over the rapid erosion of genetic resources for the crop due to shifting cultivation practices (slash-and-burn agriculture), and the large-scale exploitation and destruction of the natural forest habitat in countries with indigenous wild species of *Musa*. The greatest genetic diversity of banana remains in Southeast Asia.

An experimental station of the Bureau of Plant Industry in Davao, southern Philippines, was selected as the physical base for a global program to identify and improve strains and cultivars of the plant.

NEW SPRAY SPREADS IT VERY THIN

A new family of insecticides, distributed through a novel ultra-low volume sprayer, are the latest developments in the struggle to control the tsetse fly in Africa. The tsetse, because it is a vector of the disease trypanosomiasis affecting humans and animals, effectively prevents any development of the large areas of Africa that are its habitat.

The new insecticides, pyrethroids, are more efficient than conventional chemical controls. Hence, they need be applied in smaller amounts and represent an economic as well as functional improvement. To match the effectiveness of the pyrethroids, British inventor Edward Bals has come up

with a sprayer that can distribute the insecticide in droplets about half the thickness of a human hair in diameter. This extremely fine spray is applied by aircraft flying across the wind. Inside the spraying apparatus, 15 lightweight discs spin at about 7000 rpm, throwing off the fine droplets of insecticide by centrifugal force. Blown on the wind, only about a quarter of a teaspoon is required to treat one hectare of forest and bush against tsetse. The sprayer may be used to advantage in control programs for malarial mosquitoes, locusts, and other pests.

THIS DAM MUST BE BLOWN UP

Engineers from Britain's Hydraulic Research Station have designed an inflatable dam for use in controlling water flow in streams and rivers in remote areas and in contrasting terrains. The design seems suited for developing countries, and field tests are now underway on the Khor'Arbat River in Sudan to evaluate the dam's performance.

Made of flexible polyester coated with plastic (pvc), the dam resembles a sheet of paper that has been folded up the middle, with the bent section rolled into a tube. The flat part constitutes an apron that can be spread flat on the upstream side of the dam and anchored with stones. The tube



portion, which forms the actual dam, is filled with water to make it rigid. The British engineers claim as the dam's merits its portability, relatively low cost, flexibility of use under varying terrain conditions, and the fact that it cannot be damaged or destroyed by unusual water loads. This last advantage is one that the inflatable dam holds over conventional solid dams, although solid dams can be constructed "free" using local materials. An experimental program will see the inflatable dams installed in St. Lucia, the Virgin Islands, Dominica, and Botswana, in addition to Sudan.

POPULATION GROWTH DECLINING

News from the recent annual meeting of the American Association for the Advancement of Science (AAAS) adds another measure of confirmation to what population researchers around the world have begun to believe: the global population growth rate is declining. Based on figures compiled and interpreted from UN and national census statistics and the Population Council, research at Harvard University's Center for Population Studies shows that the world's population growth rate peaked at 1.9 percent per year in 1970. Last year, the growth rate dropped to 1.7 percent (representing a decline of about 10 percent). From 1965 to 1975, similar declines of 20 percent or more have occurred in a number of developing countries, including Thailand, South Korea, China, Colombia, North Vietnam, Chile, Cuba, the Dominican Republic, Panama, and Jamaica.

Population growth rates in developing countries overall have dropped since peaking in 1970, from a high of 2.4 percent that year to 2.1 percent, or from 42 births per 1000 to 36 per 1000 in 1977.

However, the world population is still growing rapidly. The declines mean that it will now take 41 years for the world's population to double, rather than the 36 years it would have taken at 1970 rates. World population is currently estimated to be 4.1 billion. Dr. Nick Eberstadt from the Harvard population centre, who chaired a scientific session on fertility at the AAAS meeting, said that the declines could be attributed in large part to the improving socio-economic status of families in developing countries.

REPORT ON CANADA AND THE UN

International leaders in the diplomatic and political world joined more than 200 delegates from across Canada in Winnipeg, in May 1977, to examine the question of "Canada and the United Nations in a Changing World". The topics dealt with during the 3-day conference, organized by the United Nations Association in Canada, ranged from the role of the United Nations, through the management of change and the new international economic order, to disar-

mament and future options. The emphasis was on interdependence: interdependence of the critical issues facing mankind and interdependence between nations.

The report of this conference, containing the addresses made by the 22 speakers, has now been published by the UNA. As Mr J. King Gordon, Conference Chairman, points out: "The publication... will serve not only as a conference record but as a timely resource book for students of international relations and, in particular, of the United Nations...". It is available from the United Nations Association in Canada, 63 Sparks Street, Ottawa, K1P 5A6, Canada.

FOLLOWING COLOMBIA'S EXAMPLE

According to Hsinhua, the official Chinese news agency, the country's paramedics have been supplied with a simple portable laboratory. A box of instruments, containing some 300 items, will permit the Chinese "barefoot doctor" to run up to 20 on-the-spot tests for field diagnosis of common diseases. The minilab apparently weighs less than 10 kg, making it light enough to be carried on a bicycle and into the remote and rural areas serviced by the paramedics.

Among its contents are a vacuum flask, used for stool and urine tests, a refrigerant flask for maintaining items at low temperatures, and a battery-operated micro-centrifuge. The portable lab is claimed to be both easy to handle and highly reliable. A similar, though less complex, minilab is among a number of simple health instruments developed to assist rural health workers in a Colombian project supported by the IDRC (see Reports Vol. 7 No. 1 p.8).

IT'S NOT WHAT YOU SAY...

When he began working as a village health worker, some 17 years ago, Dr Juan Flavio of the International Institute of Rural Reconstruction, Cavite, Philippines, found that he lost his audience when he tried to explain family planning. Not only were his lectures, using medical terminology, not understood, but they did not persuade or motivate the villagers to accept the new techniques.

One day, an old woman who had heard his lecture told him that when he tried to explain the uterus she thought of the earth where things grow. The sperm were seeds

Weeds may be key to wiping out bilharzia

Rowan Shirkie



Photo: WHO

The waters of the ancient Nile bring fertility to the land, and provide a place to wash dishes, but they also harbour the snails that carry the bilharzia parasites.

Researchers in Egypt are pitting a common weed against a chronic, debilitating disease that currently affects over 200 million people in Africa, Asia, and Latin America. The disease is bilharziasis, which next to malaria, is considered the greatest threat to human health in the tropic and subtropic regions of the world today. The weed is *Ambrosia maritima* (damassissa as it is known in Arabic), part of the ragweed family.

Bilharziasis is caused by parasitic worms, or blood flukes called schistosomes, that live and breed in the blood vessels of the intestines or urinary tract of humans. But the parasite's life cycle takes it out of the human body into water, and into certain snails, hence the popular name of its disease — "snail fever". Outside the human host, the parasite is very vulnerable. Damassissa naturally manufactures a substance that is deadly to the snails that carry the bilharziasis parasites.

Turning this natural phenomena to the advantage of millions of disease sufferers is the goal of Dr M. M. El-Sawy and his team of researchers at the Department of Tropical Public Health of the High Institute of Public Health in Alexandria, Egypt. Aided by an IDRC grant, Dr El-Sawy has begun a program of field tests to develop this plant into a cheap, safe, and easily applicable method of control over the snails and the disease they harbour.

Bilharziasis is an ancient enemy in Egypt. Scientists have discovered the evidence of schistosome eggs in mummies nearly four thousand years old. The disease is particularly aggressive in Egypt because of the extent and importance of irrigated agriculture, and the innumerable waterways that go with it. Current estimates place bilharziasis incidence as high as 40-50 percent of Egypt's population of 40 million.

The disease is a debilitating one. Initial symptoms of irregular fever, loss of appetite, headaches, tenderness in the abdomen, and general malaise are often masked by those of other conditions, or are not generally recognized as this specific disease. In its later stages, bilharziasis damages the ureters (ducts that carry the urine from the kidney to the bladder), kidneys, bladder, and liver. Symptoms akin to acute dysentery appear. Cirrhosis (hardening and shrinking) of the liver and enlargement of the spleen develop, as well as tissue damage in other parts of the body, according to the severity and spread of the disease. The sufferer becomes emaciated and weak. In chronic and complicated stages, the disease kills, if not directly, then by lowering resistance to other infections. Because of its progressive, slowly developing nature, bilharziasis drains the energy of the host, and destroys the ability to function productively.

In view of these enormous "savings", it is somewhat surprising that until recently improving the post-harvest system has been largely ignored. There are many different kinds of food losses and many causes. These include loss of weight, food value, economic value and acceptability, and the actual loss of the food grains themselves. They can be brought about by chemical change, micro-organisms, insects, rodents, poor handling and storage, a lack of infrastructure and inadequate preparation. To date, much of the research has focused on storage — only one aspect of the problem. Because food losses occur in the entire system, it must be looked at as a whole — the systems approach — if losses are to be effectively reduced.

An important component of the system, and one where losses are substantial — from 10 to 15 percent — is milling and processing. Yet the problems here are fairly easy to recognize and improvements can be brought about in a relatively short time. And if milling and processing involve more than simply installing a mill, the benefits greatly exceed just reducing losses, as three projects supported by the IDRC in different regions of Africa well illustrate.

None is perhaps as striking as Nigeria's Maiduguri Mill project, begun in 1972 as a joint venture of the Federal Ministry of Agriculture and Natural Resources, the North Eastern State's Ministry of Agriculture and Natural Resources and Ministry of Cooperatives, and the IDRC.

Maiduguri is the capital of the former North Eastern State, now re-named Borno State. The main food grains grown here are millet, sorghum, maize and smaller quantities of cowpeas, rice and wheat. A survey carried out early in the project showed that the region's food grain industry was predominantly an "on-the-farm" industry, with only about 10 to 15 percent of the crops entering formal market channels to supply a growing urban population. A great deal of speculation occurred before the grains reached the market, resulting in price instability: differences of as much as 40 percent were noted in the price of sorghum between four regional markets.

The grains were dehulled in the home, a process with low extraction rates, and then taken to small hammer mills to be ground. The women sifted the flour in front of the mill for home use or sale. Frequently overcrowded, these mills were found to be unsanitary, losses were high during milling and sieving and the final product was very expensive.

Following the survey of the existing post-harvest system, a consumer preference study was carried out to determine what products were required. The study showed an increase in the use of packaged flours for preparing traditional foods and a shift to processed foods. Non-traditional foods were also gaining in popularity: bread, for instance, was being purchased by 64 percent of the

households surveyed. Snack foods were also popular, particularly among children.

A mill managing committee was set up, forming a single system embracing supply, mill management, marketing and access to consumers. From the beginning the mill was simply considered to be part of the overall system. A relatively simple mill was developed consisting of a precleaner, a dehuller, plate and hammer mills and a flour sifter. A unit for heat-sealing plastic bags was also included. Power requirements are met by two low-speed diesel engines. All units, with the exception of the dehuller, were readily available in Canada. The mechanical dehuller was developed with the help of the National Research Council of Canada at its Prairie Regional Laboratory, in Saskatoon. The abrasive action dehuller can process sorghum, millet, cowpeas and maize.



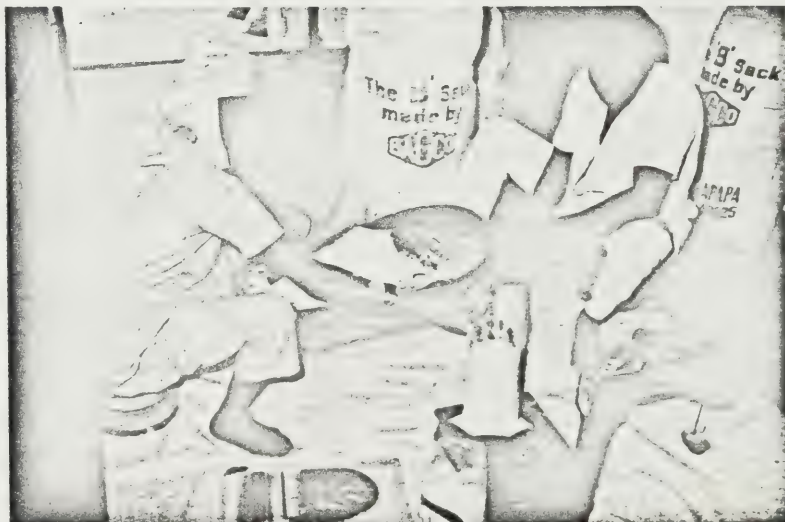
Mechanical dehulling was an innovation as all dehulling had previously been done manually, by soaking the grain and pounding it with a mortar and pestle. Losses were high, only 65 percent of the grain being recovered. The traditional product, with its high moisture content, fermented in one to three days.

The changes noted in food patterns during the consumer survey presented an opportunity to develop more nutritious food from local cereal and legume flours and a test kitchen was established. New high protein products containing sorghum, millet and cowpea flours were developed. It was found, for example, that traditional noodles could be made successfully with up to 50 percent local sorghum flour replacing wheat flour and they contained 12 to 16 percent protein. Consumer education on the use of the new products was also carried out.

By the end of 1976 the mill was processing almost 1.5 tons of grain a day. Because it uses a dry processing cycle, the shelf life of the products has been greatly extended and the grain recovery rate increased to nearly 80 percent. Mill products are being sold in the town. A bakery to use the mill's products and train others has also been built: bread containing sorghum flour as well as wheat flour is being produced and sold each day.

The advantages of the mill are that cereal losses are reduced, more processed goods are available to consumers, and women are being spared the long and tedious task of dehulling the grain. By creating a market for the local grains, the mill is also encouraging farmers to produce more, increasing their incomes

Left and below: packaged flours from the Maiduguri Mill gained rapid acceptance for use in preparation of traditional foods — they are of good quality, they last longer, and they are convenient.



A tale of two magazines

Bob Stanley

Magazine publishing is, at the best of times, a precarious business. And when the subject of the magazine is "international development" the chances for the publication's survival are slim indeed.

The problem is in large part due to the terminology. "International Development" is simply not a phrase to capture the imagination of the average reader — it sounds too academic, esoteric. Then there is the fact that most people are too wrapped up in their own problems to care — whether the problem is where the next meal comes from, or how to find the payments for the second car.

Obviously there is a world of difference between the situation in the developing world and that in the industrialized countries. But there are parallels, and they are well illustrated by two examples. *Famille et Développement* is published in Senegal for francophone Africa; *New Internationalist* is a British publication which has gained a marginal circulation throughout the English-speaking world. Both are relatively successful — which is to say they are surviving.

The origins of *Famille et Développement* were unusual, to say the least. Locally produced magazines are a rarity in francophone W. Africa, especially those that deal with development and such topics as family planning, sex education, abortion, and hygiene. Yet the need for more information on such topics was evident in a region where five years ago only one country, Mali, had officially sanctioned family planning clinics.

Following an initial survey, the IDRC sponsored a meeting in December 1973 of 24 representatives from 11 countries. Their response to the idea of an IDRC-funded, African-produced magazine was enthusiastic. Less than a year later a trial

issue was published, and in January 1975 *Famille et Développement* began publication as a quarterly magazine.

Since that time every issue has been sold out — this in spite of (or perhaps because of) the magazine's often controversial stands on topics ranging from the Pill to prostitution. *Famille et Développement* takes a frank hard-hitting, popular approach to such issues — an achievement made all the more remarkable by the fact that policy is set by a nine-member multinational board. Much of the credit for staying out of trouble most of the time must go to the editor-in-chief Marie-Angélique Savané, a Sénégalaise journalist who left the magazine recently in search of new challenges, and managing editor Pierre Pradervand, a Swiss sociologist for whom Africa has been home for a dozen years or more.

The magazine now has a circulation in excess of 20,000, and in a region where any reading material will be re-sold or passed on many times, its readership is probably over 200,000. Its appeal is far wider than the audience of "change agents" it was originally aimed for — ranging from schoolchildren and their teachers to ministers of state and their chauffeurs. Mail coming into the editorial offices in IDRC's Dakar regional office is 100 percent favourable, claims Pradervand.

Ironically, in spite of its evident popularity, *Famille et Développement* is not a commercial success. Sales of 20,000 do not even come close to covering costs, and the publication carries no paid advertising. IDRC's initial grant was for three years, by which time it was hoped to find enough African support to allow the magazine to become truly independent. That didn't happen, but *Famille et Développement's* success did not go unnoticed. Some government support has been forthcoming and the Ford Foundation has approved a grant. The IDRC will continue to support the publication with diminishing annual grants for a maximum of five years, and is helping to establish a private non-profit corporation under Senegalese law to take over complete responsibility. *Famille et Développement's* immediate future is assured.

The story of the *New Internationalist* is very different but no less unusual in the annals of magazine publishing. Ten years ago three British students at Oxford began a movement called Third World First — persuading their fellow students to donate a percentage of their grants to development charities. The idea spread to all UK universities and colleges, and the three collected 16,000 pledges.

Oxfam and Christian Aid, the main beneficiaries of the campaign then agreed to finance a magazine about development to go free to all donors once each term. It was called *The Internationalist*, and it first appeared in September 1971. Eighteen months later the two agencies were persuaded to form a joint company, Devopress Limited, to publish a monthly magazine, and the *New Internationalist* was born.

In Britain, far from being a shortage of magazines, there is a surfeit, catering to all tastes and topics — and the competition is tough. The staff consisted of Lesley and Peter Adamson, who were two of the original trio, one secretary, and marketing manager Dexter Tiranti. Somehow they managed to produce a lively, radical, thought-provoking monthly magazine, while Tiranti went out and almost single-handedly sold 12,000 subscriptions.

As with *Famille et Développement*, the *New Internationalist* is not a financial success. Money continues to be a problem. Two years ago the company became a cooperative, the staff have raised money by doing work for development agencies, and they receive financial support from government and non-government organizations in Canada and Australia, in addition to the two original backers in Britain.

In Australia recently, Peter Adamson was told the magazine was highly valued as a source of ideas and information of development activities in other parts of the world. And earlier this year the *New Internationalist* began publishing a special Canadian edition to cater to the increasing demand in Canada.

Says Lesley Adamson: "It is this type of feedback which makes us think that the magazine is having some impact and is worth continuing."

Famille et Développement and *New Internationalist* cater to different audiences in different societies and approach their subject matter from different perspectives. But if the Adamsons, Savané and Pradervand were to sit down around the same table they would find their common objectives and common problems far outweighed their differences. □

For subscription information write: *Famille et Développement*, B.P. 11.007, CD Annexe, Dakar, Sénégal. *New Internationalist*, 175 Carlton Street, Toronto, Ontario, M5A 2K3 (in Canada only) OR 62a High Street, Wallingford, Oxon, OX10 0EE, England.

RADIO school for millions

Susana Amaya

Thirty years ago a young priest named Jose Joaquin Salcedo, recently appointed to the parish of Sutatenza, a small village in Boyaca, Colombia, had the idea of communicating with his parishioners by means of a homemade 100-watt radio transmitter. He installed three battery-operated receivers in strategically located homes in the Sutatenza Valley, and there the people met and marveled at hearing the priest's familiar voice coming to them from such a great distance.

Thus began the most powerful rural educational radio system in existence today in Latin America. Mass Cultural Action (ACPO), or Radio Sutatenza as it is better known, controls an impressive national network of 685 kilowatts that reaches as far afield as Venezuela, Panama, Ecuador, and Peru. In 30 years Radio Sutatenza has offered literacy classes, training for farm and household work, religious and civic instruction, and above all a system that exists exclusively for the use of the rural peoples within a society that otherwise denies them the opportunities available to other citizens.

Today 17 Latin American countries share 36 educational radio services. Some are operated by small affiliated broadcasters, such as Radio Sutatenza, who transmit locally-prepared programs. Others, like ERBOL, the Bolivian Radio Schools, broadcast on a network basis.

The rapid advance of this system in the short period of 30 years is due to the fact that it is the only means of bringing education to the rural masses — UNESCO data show that less than five percent of Latin America's 100 million rural inhabitants complete primary school.

In spite of the flourishing growth of educational radio in Latin America, it is still too early to form conclusions as to its effectiveness as an educational alternative for adults. In an effort to come to some firm conclusions, ALER (the Latin American Association for Educational Radio) carried out a comparative analysis of more than 30 different research projects on the subject undertaken since 1959. The study by Juan Braun, which was supported by an IDRC grant, reveals some common characteristics of radio schools: a basic audience of

illiterate peasants (with the exception of a few groups attempting to complement primary or secondary studies); programs concentrating on each country's most marginal population groups; "classes" made up of men and women between 18 and 50 years of age; group activities coordinated by a monitor or group leader; use of complementary media such as publications, visual aids, tape cassettes; programming run for the most part by the Catholic Church, or having close ties with it; state or participant financing, or funds from donations by national and international foundations; most began in the 1960s and have since been able to expand their operations; transmitter power usually not more than five kilowatts (with the sole exception of the 685 kw equipment at ACPO).

Overall the projects show that radio is as effective as other mass interpersonal media in producing learning, and that, complemented by written materials, it can be as effective as formal schooling or an educational television system. Yet all the radio schools combined reach only one percent of the potential listening audience of 180 million people.

The ALER study finally offers some recommendations for future research in this important field of educational communications. These include the cost-benefits of educational radio, systems of listener participation, and analysis of listeners' correspondence as feed-back.

Simultaneously with the ALER study, the Communications Science Research Institute of the Bolivian Catholic University undertook a year-long analysis of the impact of ERBOL. Nothing illustrates better the need for a "long distance" educational program, and its potential contribution to the education of rural and marginal urban peoples.

Bolivia has 4.7 million inhabitants, 3 million of whom are illiterate; 40 percent do not speak Spanish, and 30 percent speak Spanish only as a second language. Most of the rural population lives isolated and on the fringe of the formal educational system.

ERBOL was created nine years ago by the directors of five Catholic Church radio stations. Later four other affiliates were incorporated to constitute the present system, a loosely integrated network linked by common objectives.

These are primarily to improve the small farmer's agricultural skills and health, and to integrate the rural people into national life by means of literacy and language.

By 1975 ERBOL was serving 1,060 "listening groups" in rural, urban, and suburban areas, with 13,000 participants coordinated by voluntary workers and backed up by 153 employees. No affiliate owns a broadcasting station. All of them belong to the Catholic Church, and are distributed in such a way as to cover all the country, with a potential listening audience of 2,600,000.

Most of the affiliates have their own recording equipment. Some prepare

complementary materials directly, and there is a sporadic interchange of material and experience. ERBOL itself is a central body whose role is to distribute foreign contributions and aid, and assist in the exchange of educational materials. Locally produced programming makes sense in a country whose diversity of ethnic groups would be difficult to integrate under a single educational broadcasting method and model.

The level of training of the radio educators varies — many have city secondary school educations and some have university degrees. Their incorporation into the system is made possible by the support of the Ministry of Education. However, more than 70 percent of these educators come from urban areas, often resulting in a conflict of their cultural backgrounds with those of their audience.

Local leaders, or broadcasting aides, do come from the communities, and in some cases are selected by them. They must be able to read and write, have a certain position and prestige in the community, and an aptitude for volunteer work. Once or twice a year they take short courses on educational broadcasting methodology, as well as subjects like agriculture, health, cooperatives, and Bolivian law. Their role is to assist the groups of students who gather in community centres, schools, or sports clubs, to listen, learn and discuss.

This detailed study of Bolivian educational broadcasting, supported by an IDRC grant, concludes that, in spite of some deficiencies, the service given by ERBOL is of considerable significance in the education of the Bolivian adult. The listeners themselves express satisfaction with the education received, and the resultant awakening of a critical consciousness is reflected on the community level in the formation of cooperatives, mothers' clubs, and community action groups, and in environmental improvements.

In the south of the continent lies Uruguay, a country whose economic, geographic and cultural conditions differ markedly from those of Colombia and Bolivia. Here an experimental program is attempting to establish a two-way communication system.

The project is run by the Department of Communications of the Institute for Uruguayan Socio-Economic Development (IPRU), and is jointly supported by the IDRC and the Inter-American Foundation. Its goal is to explore the possibilities of the cassette tape recorder as an instrument of communication for rural development.

Project director Mario Kaplun, reports that the key to the experiment is not so much in the technological possibilities of the cassette recorder as in the methodology of the "forum". A similar approach has been used with radio in Canada, India, Ghana, and recently in Tanzania. Participants meet and listen to a program, analyze and discuss the topic

Towards a global society

Arthur C. Clarke, author of numerous books on space and deep-sea exploration, has been called the "godfather" of satellite communications. As early as 1945, he proposed placing "space stations" in synchronous orbit to relay communications around the globe. He calculated that three satellites positioned to keep pace with the earth's rotation would be sufficient to provide world coverage. Clarke's vision became a reality 24 years later when INTELSAT satellites over the Atlantic, Pacific, and Indian Oceans formed a global satellite system.

At a meeting of Experts on the Development of News Agencies in Asia late last year, Clarke sat in as a special guest and made some observations on what the future holds in the field of communications. Here are some excerpts:

Recently I was invited to the Comsat Labs, and was also guest of the Indian Space Research Organization at the EUROCON 77 Conference in Venice. So I have been able to see some of the latest developments in the exploding communications field.

Though we have to make do with what we have now — and many developing countries don't have that! — we should also realise that in the very near future almost any communications feat will be possible. The only limitations will be legal, financial and political — not technological. For example:

The Indian educational satellite experiment, SITE, required village receivers using three-metre chicken-wire dishes. That was only a few years ago; now the same job can be done with a one metre dish. And when I was at NASA the other day, I saw a prototype of the wrist-watch telephone which, sometime in the 1990s will enable anyone to dial a number from anywhere on earth, via the giant communications satellites the Space Shuttle will establish. The reporters of the next generation will be able to send news, pictures and films directly to their editors from a box about the size of a briefcase, without even going through any local news agency. Are we already planning for the past?!

And will there be any newspapers much longer? At the Venice EUROCON, I saw an impressive demonstration of the British Post Office's VIEWDATA system, soon to start nation-wide trials. With this, an ordinary domestic TV set can give access to millions of pages of printed display — news, business, sport, entertainment — only what you ask for, and nothing else! Everyone will be able to have his unique private newspaper, to suite his own specific requirements.

Are such technological marvels applicable to the developing world? Thanks to solid state electronics, the answer is yes. Look at the pocket calculator. Ten years ago, no amount of wealth could have bought such a device. Now every shop-keeper has one — and soon every schoolboy will.

This is the message I am trying to give you. The future will be determined by the scientists and engineers, not by the politicians who have too long divided mankind. Just as the telegraph and the railway made the large nation state not only possible but inevitable, so the jets and the communications satellites will complete the next stage in that evolution — the global society.

I hope that the organization you are planning will tell the world more about your rich and diverse cultures, which are part of the glory of mankind. But I also hope that it will be compatible with the One World we must now create — if we are to have any world at all.

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The child was sick with chickenpox, pneumonia, and high fever. The nurse at the remote health outpost was worried and wanted to know if the child should be taken by airplane to a regional hospital, 200 rugged travelling miles away, but could not get through radio interference to reach the hospital. Then she turned to the new equipment that would make the necessary communication link via a satellite orbiting 22,300 miles above the earth. Contact. A brief consultation with a physician at the hospital showed that there was nothing to be gained in subjecting the child to a discomforting plane trip, and confirmed that the treatment being given by the nurse was correct and sufficient.

The incident took place in a remote area of northern Canada, during a telemedicine experiment. Telemedicine — literally, medicine over distance — is the use of telecommunications channels such as radio, television, telephone, and satellite to deliver health care. A few years from now, the scene might be acted out in any of a number of developing countries that share the same sort of problems as Canada in delivering health services to a population scattered over a large area.

With the launch of Russia's Sputnik in 1957, satellites ushered in a new age for communication, largely eliminating barriers of distance and geography. Some experts now believe that satellites can have the same sort of impact on medicine, at least in the areas of primary care and medical education.

As the technology advanced in the 21 years since that first launch, it has been possible to move from complex, expensive ground receiving stations to sturdy, readily portable terminals as small as one metre in diameter. Satellites such as Hermes (or CTS for Communications Technology Satellite), a joint Canada-USA venture launched in early 1976, are 10 to 20 times more powerful than any

The newspaper as a catalyst

Narendra Aggarwal

India is a land of villages — 500,000 — to be precise. Perhaps that is what prompted the Father of the Nation, Mahatma Gandhi, to affirm that India lives in the villages. How true, even today, after three decades of independence.

"Our Village Chhatera" used to be like any one of the half a million villages in the country until 1969. This is the story of how Chhatera was put on the path to self-sustained growth thanks to the efforts of a big city newspaper.

The Indian newspaper is very largely an urban phenomenon. It was with the object of opening a little urban window on rural India that the *Hindustan Times* decided to start a regular fortnightly column depicting life in a typical north Indian village. The choice fell on Chhatera.

And so began Project Chhatera — an experiment in development journalism as a result of the far sight and vision of the newspaper's new editor, Mr. B. G. Verghese. In the nine years the Chhatera project was on, a live example was placed before the Indian Press as to how it could play the role of a catalyst to rural development.

Chhatera is about 40 km north-west of Delhi, a short distance off the Grand Trunk Road, in the neighbouring state of Haryana. But it lies in the 'V' of two flood water drains which at that time were unbridged and thus the village was cut off from civilisation for a major part of the year.

The village has a population of 1,500 made up of the land-owning Jats, the Brahmins and the landless Harijans, or the lowest caste. It is primarily an agricultural village. Yields and incomes were low when the project started as new high-yielding seeds and techniques of cultivation had not reached the village. The lowest caste were not even assured of two square meals a day.

To be truthful the project began with the object of purely reporting rural India to our highly urbanized readers. It was on February 23, 1969 that "Our Village Chhatera" made its first appearance as the cover-story of the *Hindustan Times* Sunday magazine. Using a lucid style, bold headlines and breath-taking pictures of the countryside, it was an instant hit with many readers. Some, however, said the editor had gone insane. Imagine giving so much space and attention to 'a' village. Where was the 'news', they asked.

The plan of action was that a team consisting of two reporters and a photographer would visit the village every alternate Sunday. The stories and pictures would appear the following Sunday. The editor would himself accompany the team two out of every three visits. The schedule was kept up unbroken for nine years until with the change of editors the Chhatera project was dropped in 1977.

With the splash given in the newspaper, the villagers overcame their initial shyness, the ice was broken and soon friendships were established. In the beginning the village was described, as also its institutions and people. Gradually the villagers began to tell us about their woes.

The old hanging rope bridge across the drain was decaying. Some persons had lost their lives while crossing the bridge during the monsoon to reach their fields which lay on the other side. The old primary school building had collapsed. We wrote of a hundred-odd children attending classes together in the village common place. The well from which the Harijans drew water was crumbling making it unsafe, and resulting in the water use in the community going down.

Besides highlighting the problems we wrote of how the villagers celebrated their festivals, marriages, the change of seasons, the gaiety that marked the bringing in of every good harvest home, village fashions, old traditional jewellery, the aspirations of the young and how they looked to the future — all human interest stories.

As we highlighted the problems, the authorities and others began to take

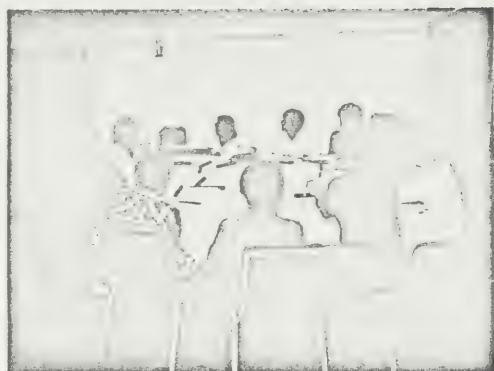


Photo: Hindustan Times

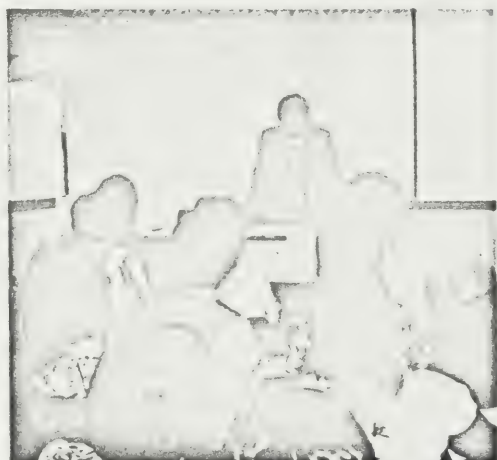
Results — farmer Nukal Singh and agronomist N.K. Mohta, of the Indian Agricultural Research Institute, inspect the first soybean crop to be raised in "Our Village Chhatera".

Evaluating Asia's nursing needs

Reginald MacIntyre



Above: participants divided into smaller groups to identify the most urgent priorities. Below: IDRC Asian Regional Director, Jingjai Hanchan-lash, at the workshop opening.



How can a group of professionals accord priority to one or two projects out of many when computers and masses of statistical data are not available to help in the elimination process? This was the problem faced, in mid-February, by 21 senior level nurses from schools of public health, health ministries, universities and hospitals in Indonesia, Korea, Malaysia, Nepal, Sri Lanka, the Philippines and Thailand. They met in Singapore to identify the most pressing research needs related to the nurse's role in health care in Asia and to draw up a research proposal.

At the workshop, which was sponsored by the IDRC, the participants learned about the problems of health care delivery and the roles of nurses in other countries, and how to apply modern techniques, like the nominal group method, to problem solving.

Divided into two groups, the nurses identified the research projects they thought the most urgent. These were listed and discussed and the participants then selected, and rated on a scale of 5 to 1 in order of priority, the five projects they felt were most worthy of support. The totals were tallied and the five projects receiving the highest score were again rated by the nurses, this time on a scale of 100 to 0. After further discussion, the top two projects were chosen for definition, elaboration and possible support.

Although the participants may at times have felt that they were developing "instant projects", all realized that the long 8-hour days and the discussions that ensued during the evenings were equivalent to countless hours of hard toil that would have been needed in other circumstances in order to isolate the areas of research that all could enthusiastically support. The nurses did arrive at a consensus and developed two detailed proposals that they hope will find support from international donor agencies.

The first proposal was entitled "Identification of Nursing Needs and Requirements in Relation to Health Services of a Rural Population". The main

study areas would be the health problems, the nursing services needed, an assessment of services already available to the community, defining target nursing needs and determining a proper nurse population ratio. The work would be carried out through detailed surveys. Procedures were worked out for every step of the proposed three-year project, from an initial review of the literature through the design and testing of the forms, training of the data collectors, processing the data, interpretation and analysis and finally the reporting of results.

The second proposal was for an "Evaluation of Nursing Components in Rural Community Health Services". It was equally comprehensive with the overall objective of improving the community health services made available through the health centres. The group felt it was necessary to have a detailed study made of the amount, type and effectiveness of supervision at the various levels, and to determine the attitude of workers in order to offer concrete suggestions to health planners, policy and decision makers and institutions responsible for training the supervisors.

At the end of the workshop one of the group leaders, Mrs. Nelida K. Castillo from the Philippines Department of Health in Manila, said: "This is the first nurses' workshop in Asia where each participant was able to contribute concrete proposals, and present their own data and arguments to improve nursing practices in their country. The learning process was stimulating because each person had to be prepared to defend a project proposal, and thereby learn by actively participating rather than passively listening."

The second group leader, Miss Kasil Oh, an Assistant Professor at the Nursing Research Institute, College of Nursing of Yonsei University in Seoul, Korea, said she had "a beautiful feeling to be learning from my Asian associates how to solve our problems. At first I felt the problems belonged to others or were the responsibility of society, but as the workshop progressed, I realized that I could be part of the solution process."

In their assessment of the week-long workshop, all the participants felt they had benefitted greatly from having gained experience in the research identification process and the development of a research proposal and having learnt, and used, the nominal group method.

A Nepalese nurse, Uma Deri Das, told me as we parted: "This workshop is going to give something to Nepal". I think she's right. □

Reginald MacIntyre is an Associate Director of the IDRC's Publications Division.

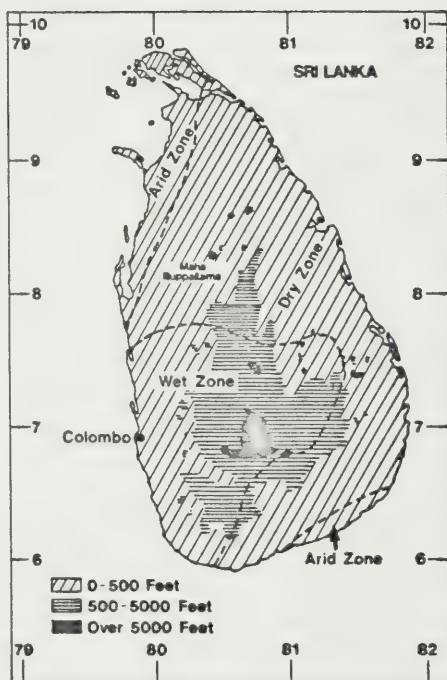
Sri Lanka the living laboratory

Bob Stanley

For the past 2,000 years or more Sri Lanka's traditional farmers have worked the land in much the same way — providing in a good year enough food to feed their families, maybe even enough to store some away for a bad year.

But times have changed. In the past 100 years most of the best land has gone to cash crop plantations producing valuable exports such as tea, rubber, and coconut. Sri Lanka's population has grown too, and the traditional farming systems, that exploit at best only 50 percent of the land's potential, can no longer provide enough food to meet the people's needs.

That, in simple terms, is the reason why some of Sri Lanka's top agricultural scientists have recently become very interested in something called cropping systems research, also known as multiple cropping, or multi-cropping for short.



Above: Traditional rice farming in Sri Lanka — dry planting of rice before the monsoon could speed up the paddy cultivation and permit a second or even a third crop to be grown. Top right: Sweet potatoes planted after rice in an experimental plot at IRRI, the centre of the Asian Cropping Systems Network of which Sri Lanka is now a member.

After a moment or two, she left the table suddenly without warning and went to another room to fetch some books and papers. She put these on the table, then left again, leaving the researchers and myself alone. When she returned she was wearing a ring that I was told symbolized a "power" of healing, and she sat down with us again.

For a while she answered my questions, looking at me only occasionally. She had been a healer for four years, she said. She did not specialize in any particular disease. Her mother and father both had been *guérisseurs*. She seemed slightly disarmed by my question about whether it was unusual for a woman to be a healer, and replied that for her, the sex of the *guérisseur* was unimportant — in her case it was a gift from God since her birth.

Then quite unexpectedly she became agitated, shivered, and began to chant in a sing-song voice that had suddenly taken on a harsher, more authoritative tone. As this happened, she scribbled furiously on a pad of paper with a pen. I gathered from my companions that it was the "spirit" speaking and writing through her.

She continued like this for some time, continued to answer my questions, and then abruptly seemed to shake off the seizure, yawned, and looked as though she had awakened from sleep. We left soon afterward to return again when she was treating her patients.

Butoyi makes use of both herbal medicines and spiritual concepts in her treatments, and, like many African healers, borrows and adapts certain rituals from Western medicine. She does not go as far as some healers, who don a white laboratory coat to give an air of scientific authority to their ministrations, but she conducts her clinics in an atmosphere reminiscent of a Western doctor's office, complete with professional manner and scribbles on what could pass for a prescription pad.

The night I visited her "clinic" she sat at the same table at which I had interviewed her, as her patients sat in front of her one by one and she listened to their symptoms and then prescribed their medicines. Unlike the situation in a Western doctor's office, however, all the patients were present in the same room while the prescription process proceeded, except those who had already received their medicines and left.

The prescriptions were contained in old whisky, wine, coke or beer bottles, and sometimes mixed on the spot from liquids of various colours. Sometimes Butoyi gave instructions to the patient for mixing them at home. As she prescribed she scribbled on her pad or consulted a notebook.

But that was not the end of the patients' visit. After the prescription of drugs, each patient put on a red turban, and was placed in a chair for a quasi-religious ceremony. The healer and her daughter also wore turbans, and an aide put on a phonograph record of singing accompanied by a guitar.

It was pleasant, soothing music, designed, so I was told by my companions, to calm the patients. While it played (the same song over and over again), Butoyi and her daughter slowly moved around the room and in front of the patient in a kind of dance step, swinging red cloths rhythmically with their hands. As they did so they sang and Butoyi repeated incantations gradually with increasing speed. This was to liberate the patient's spirit so as to free him of disease. Eventually, at the end of the incantation, the patient retired from the chair, another patient took his place, and the process was repeated. It went on for hours in the lamp-lit room, children and adults sitting quietly on chairs or on the floor, waiting their turn, until all had been dealt with.

Butoyi's methods of treatment are not typical: there are many different varieties of healer and many different types of treatment. But they do illustrate the healer's very personal approach to his patient, and the attempt to deal with illness not only through the body, but also the mind and spirit. □

David Spurgeon is senior science writer for the IDRC, and is currently preparing a book on the subject of traditional medicine.

New President addresses Governors

The IDRC's Board of Governors held its three-day semi-annual meeting in Sri Lanka from March 16-18. It was an occasion for "firsts" — the first such meeting to be held in Sri Lanka; the first meeting under the Board's new Chairman, Maurice Strong, who took office last November; and the first meeting for new President Ivan Head, who officially joined the Centre just three days before the meeting.

Sri Lankan finance minister Ronnie de Mel addressed the governors at the opening of their policy session. While praising the IDRC's practical approach to development, he also warned against the dangers of falling prey to "expert's jargon" and the use of inappropriate technology.

"Science and scientists have helped developed countries to achieve accelerated rates of growth," he said. "However, the exultation that scientific discovery has produced in the West should not blind them to the fact that the application of science and its handmaiden technology in any society should be firmly grounded in the practical realities of that society."

Development, added Mr de Mel, was not a matter of economics, or of theories and slogans, it was the art of helping the people. Experts sometimes had a tendency to clothe their ideas in jargon, and to become obsessed with expensive and unnecessary gadgetry. To do so, he said, was to become irrelevant. "If they lose sight of the human element in the developing process, then they have lost sight of everything," he added.

Mr de Mel also praised the IDRC's practice of holding one meeting each

Babu-Edi's office is contained in his small house in a residential area of Matadi. It is reached by a stony path that runs alongside a ditch which is crossed by means of a steel frame of a truck that serves as a bridge. Babu-Edi is an herbalist, but he also practices spiritualism which he learned from his grandfather, who was also a healer. He is methodical, and keeps records of his patients in a big ledger: their names, addresses and other details, and their presenting symptoms (under the heading *Motif*). Once he has taken down these details, he sometimes retires to his small office and determines the diagnosis by divination.

Babu-Edi tries to tell his patients what has caused their illness. He considers this important so that he can cure it. The patient's way of life is considered important in this respect, but it is not considered the only cause of illness. He also gives the patients general advice regarding their way of life as well as medicines and specific prescriptions, and he is well regarded by his community because of his gift of healing.

Butoyi Chibashimba is 29 and darkly pretty. She is unmarried, and lives with her nine-year-old daughter in a small house in suburban Matadi. She makes her living by healing the sick with a power that she believes comes from God.

I met three of her patients one warm night in November 1977 as I sat outside her house watching the neighbourhood children play noisily as Butoyi's rituals and incantations went on inside. All three had first been disappointed by the failure of Western medicine to cure their ills.

One was a woman in her 20s who had continuing stomach and chest pains after her first child. She first went to the modern hospitals for relief, but it did her no good. The pains continued. Finally she heard of Butoyi, and came to her. Butoyi gave her medicine to drink and massaged her body — and the pains disappeared. "It's the first time", said the woman, "I ever went to a healer who healed".

The second patient was an accountant in his 30s, a tense, rather belligerent man who suffered from migraine headaches. His visits to medical doctors had likewise failed to bring him relief. This was the first time he had resorted to a healer — but she had listened to him and given him medicine, and already he was feeling better.

And then there was a young father in his 30s, soft-spoken and with a gentle smile, who was not himself a patient, but whose baby, he was convinced, had been cured of a deadly anemia in an almost miraculous way that even the doctors couldn't understand.

Sabiaku Grandmaitre, another healer, lives in a tiny dark house hidden away in one of the many small alleyways in central Matadi, a house that is almost cave-like in its blackness.

Sabiaku told us he first tries to determine whether the symptoms the patient is presenting are those of his real disease. Depending on this, he might, for example, treat a headache either by massage or by an incision in the skin (which healers in Africa use in place of an injection). Some healers, he said, have a power of touch that will cure a patient's headache. This power can also be passed on by training. A third method of treating the headache might be to use eye drops.

First, however, he looks for the cause of the headache by talking to the patient about it. He may inspect the nose to see if there is a physical cause, for example, enlarged blood vessels, which he would then treat by emptying the vessels through inducing a nose bleed. He will ask about the patient's digestion, and if he sleeps well — and finally if all these indications are negative he will ask if the patient is "tranquil in spirit".

In other words, the healer looks not only for physical causes of a malady that in the great majority of cases is emotionally-caused, but for emotional and spiritual causes as well.

This in fact is one of the healer's strong points: he views his patient's life as whole, not as a collection of pieces. Though some healers, like some Western medical practitioners, are specialists, few are narrowly confined to one specialty, and all are part of a common culture. They live with the people they treat, and in most cases they know a lot about their patients and their families, and their treatment takes account of such factors.



Dukun: he has been a healer — like his father before him — for 38 of his 50 years, he specializes in fractures and massages, and sometimes works up to 15 hours a day.

Most, if not all, developing countries have their own systems of traditional medicine. Among the people of North Sumatra, Indonesia, who number about seven million, traditional medicine continues to be the major form of treatment. In Zaire the healers are known as *guérisseurs*, here they are called *dukuns*.

At North Sumatra University, Dr. Hasjim Effendy, the head of the department of physiology in the medical school, told me: "All Indonesians have had contact one way or another with dukuns. Fifty percent of Indonesians use dukuns."

Born in Medan, Dr. Effendy himself was treated by dukuns as a boy, and he tries hard to be objective when considering their traditional medicine in the light of his scientific training. "I want to verify the results by medical techniques," he told me. "Then I'd say the results are OK".

For the previous year, Dr. Effendy had been working with his colleagues on a survey of traditional healers sponsored by the IDRC. The objective is to determine the role the dukuns play in delivering health care in order to provide policy-makers with a basis on which to shape national policies concerning the healers and to determine the feasibility of upgrading their practice for use in a national health scheme.

The study has concerned itself with 15 dukuns from each of five districts in the province in which Medan is situated, and investigates how the dukuns treat illness and their knowledge about and attitudes to health procedures. This is done by means of pre-tested questions and by observing the dukuns in their practice for about two months.

Dr. Effendy gave me some of his personal impressions, although the study had not been completed. "Sometimes," he said, "I am surprised by the efficacy of their treatments — but that has to be verified." He said the dukuns are very good at setting bone fractures and dislocations, and the healing process seems to progress faster than it does with modern medical methods. He planned to make a more scientific assessment to see if this was indeed the case, and if so, why.



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Contents

3 Which doctor?

David Spurgeon meets traditional healers in Africa and Asia, and examines the reasons behind the recent "discovery" of traditional medicine.

6 New President addresses Governors

Report of the IDRC Board of Governors meeting in Sri Lanka.

8 Sri Lanka the living laboratory

Agro-climatically speaking, Sri Lanka is Asia in microcosm — which makes it an ideal place for research, reports Bob Stanley.

10 Evaluating Asia's nursing needs

Reginald MacIntyre reports on a Singapore workshop that really worked.

11 Dossier: media and messages

Getting the development message across is never easy, and the importance of getting it right is often underestimated. In this *Dossier*, eight articles on different aspects of development communication — from agricultural journalism to space age speculation.

19 Less waste, more food

It's as simple as that, but it's not that simple. Michelle Hibler reports on the new emphasis on post-production technology.

22 Weeds may be key to wiping out bilharzia

Egyptian researchers are working on a means of prevention of this disease that affects millions, reports Rowan Shirkie.

24 Briefs

People, projects, events.

25 Viewpoint

Readers' views on *IDRC Reports* articles.

26 Commentary

David Henry looks at rural water technology and concludes: there must be a better way.

27 New publications

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Contents

3 Community health in Haiti — participation is the key

Bernard Méchin looks at a health project in Haiti where the emphasis really falls on the community.

6 Somalia: Nomads no more

When drought decimated the herds of East Africa's nomadic pastoralists, they were forced to change their way of life. A.A. Laquian reports on how they have adapted.

8 News needed from the food front

Sri Lanka's journalists have neglected food and agricultural reporting, says B.H.S. Jayewardene.

9 Drug abuse a growing problem in West Africa

Jean-Marc Fleury reports that teachers in West Africa are concerned about the rise of drug use among students.

11 Dossier: energy and conservation

Developing countries may be the first to enter the "solar age" of renewable, sustainable sources of energy. Some of the technologies and policies that may help them make that transition are described in the seven articles of this *Dossier*.

19 Adapting forage to changing needs

Neil Thomas reports on new forage production systems that may help overcome water shortages in Northern Mexico.

21 Vietnam fights a different war

This time it is against disease. Anil Agarwal describes how Vietnam waged a victorious battle for health.

22 Commentary

Noazesh Ahmed suggests that a whole new strategy of agricultural development is needed in Bangladesh.

24 Briefs

People, projects, events

25 Viewpoint

Readers' views on *IDRC Reports* articles

26 Two films, twice the impact

Two new IDRC films focus on Project Impact, an innovative system for the delivery of primary education.

27 New publications

Community health in Haiti — participation is the key

Bernard Méchin

At the nutritional rehabilitation centres, the community learns the principles of good nutrition. Here a health worker explains how to prepare the enriched milk supplement.



Photos: Neill McKee

In Haiti where peasant agriculture predominates, the average farm has only two acres, trees are cut for firewood and the soil erodes. Roads are lacking and schools are poor. The people of this overpopulated land have the lowest standard of living in the Western Hemisphere. Some 87 percent of the population are illiterate. Life expectancy for men is 52 years, and for women, 45 years.

It is afternoon. In the courtyard of a small pink house with green shutters, about 30 children are sitting quietly under a shelter made of palm leaves. Some are being fed a meal that their mothers have just prepared according to instructions given them by the Head of the Nutritional Rehabilitation Centre of Grand-Goâve, a village in southwest Haiti where we now find ourselves. She briefly explains its operations to us. The Centre feeds about 30 children suffering from malnutrition (called "swelling disease" here — a grim recognition of the distended belly that is its classic symptom) four times daily, six days a week, for three months. At the same time, each mother is given instructions on how to prepare and balance the meals nutritionally. Once released by the Centre, the children will continue under observation, returning every five days to be weighed and, if need be, given enriched milk.

In a shed next to the Centre's main office in Grand-Goâve, a number of employees busy themselves preparing the enriched milk supplement. One pours a bag of powdered skim milk,

another adds sugar to it, while a third stirs oil into this mixture. The milk is distributed to children suffering from malnutrition, in a 1200 gram bag that is calculated to provide a 2-week ration based on a daily intake of 400 calories and 20 grams of protein.

The sun is hot, but the air has a cool tang, for we are in Meilleur region, about 800 metres above sea level. The surroundings are enchanting. The gently rolling green hills are dotted with various crops — peas, beans, tomatoes, maize, yams, and potatoes. The natural vegetation here is lush. The trunks and brilliant foliage of palm trees, "real trees" (a kind of breadfruit), "trumpet trees" (not unlike the yagruma), "mombin" (trees of the Ceiba family), and many other species punctuate the landscape. Dry stone walls trace out rough squares of land wherever there is flat ground — flat ground here being any area that does not slope too sharply. Rocks and stones that have not yet been collected into walls still lie scattered over the land. Tiny stepped terraces, each bearing one or two rows of different crops divided at regular intervals by hedges of cuscus or Guinea grass, cut across the hills.

Throughout this area, in fact, an agricultural demonstration is underway, supported by community councils and brought into being with the help of agronomists and soil conservation experts. The results speak for themselves: the land under cultivation has doubled, harvests have increased, and the crops themselves are now more diversified. The soil has been preserved or restored to fertility.

Bernard Méchin, an Associate Director of IDRC's Publications Division in charge of French publications, visited Haiti earlier this year to assist with the preparation of the numerous reports and studies resulting from the Integrated Health and Population Project. These documents will be published at the end of 1978 by the Department of Public Health and Population of Haiti.

In the heart of the village of Meilleur, whose houses weave out in colourful twisting threads into the surrounding fields and hills, a long new rectangular building faces the church. It is the school (which because of increased enrolment, has had to overflow into the church as well) and the health centre. This Wednesday morning, as on every Wednesday for the past three months, a dozen people are assembled in a small room. Seated behind tiny desks, ten healers — four *matrones*, two *houngans*, two leaf-doctors and two *piqûristes** — are raptly following the words of a nurse and an instructor. The two stand side by side at the blackboard teaching hygiene and preventive medicine in Creole, the dialect derived largely from French that is the natural language of Haitians.

Then the dialogue begins; questions and answers about current hygiene and health problems break out from around the room; At what age should babies be vaccinated against the main diseases? How many doses do they receive? What food should they be given? What are the symptoms of this serious illness, and that? What should be done about them? And so on.

These weekly meetings, organized for each district within the framework of a pilot program for training healers, are aimed primarily at familiarizing the healers with the basic aspects of modern medicine. It is hoped that they will be encouraged to incorporate into their practice the knowledge and methods that have proved themselves successful, and, at the same time, to gradually abandon any harmful treatments that they may have been using.

The healers are often community leaders, and it would be impossible to deliver health to the rural masses without going through them. Popular fear and mistrust of doctors (who are distant in every sense of the word), adds to the immense prestige and influence of the healers who live and practice among this peasant population.

These are only a few examples of the kinds of action taken and the results obtained since the beginning, in 1975, of the Integrated Health and Population Project (PISP) of Petit-Goâve, Haiti. This pilot project in community medicine serves more than 34,000 people spread over three rural districts — Grand-Goâve, Meilleur, and Trou Chouchou. It is run by the Family Health Branch (DHF) of the Department of Public Health and Population (DSPP) of Haiti. Financing is guaranteed until the end of 1978 jointly by the DHF, the IDRC, and a German aid organization, *Bröt für die Welt* (BFDW).

According to PISP's directors, the project was established to contribute to promoting improved health in the rural population, and to provide ordinary health services, especially to mothers and children. At the same time, it improves the protection of the community against the main contagious and infectious diseases. Part of the project's aim is to distribute information and provide technical, material, and financial assistance to government programs of maternal-child health, family planning, nutrition, and medical and sanitary education in the rural districts.

The project also aims to carry out research on various aspects of public health and population dynamics in order to recommend to DSPP the least expensive and most effective methods of providing health care appropriate to the Haitian rural environment.

As explained in PISP's first newsletter, the strategy adopted to achieve this goal stresses going to the people, bringing care and service within their own communities. The implementation of the program is therefore centered on community participation and draws on all locally available resources (healers, councils, leaders, and other community institutions).

PISP started out by concentrating on preventive medicine, while offering service in curative medicine. Now, caught up by community initiatives, it is evolving quite naturally into a form of integrated community development. The PISP team is well aware of this. One of the project's preoccupations was to encourage the populations affected to actively

participate in the implementation of the health program, making them understand that the Integrated Project was their project, and that it was up to them to ensure its continuity. The need and desire to support health activities stimulated other development efforts within the community.

Based on this strategy, what means were implemented to provide health services?

The main means used to deliver services is the community health team, which receives medical and technical direction from a doctor assisted by five medical auxiliaries. The PISP target region has been divided into three areas, each with about 10,000 people (plus one other area as a control). Each area contains five zones of 2000 people who are regularly visited by a community officer. Each zone is subdivided in turn into four sectors of 500 inhabitants, each the responsibility of a community assistant. There are thus 20 assistants and five community officers per 10,000-person area, all of whom are under the control of a supervisor. The assistants and community officers are both the outposts and the spearhead of the project team; it is they who maintain liaison between the professional staff (two doctors, a sociologist, a demographer, and an administrator) based in Petit-Goâve and the target population. The majority of them, especially the assistants, belong to the community they work in, and they are therefore completely familiar with the health needs, problems, and events — births, deaths, and illnesses — that arise in their sectors.



Home visits by community health workers have provided data on local health conditions and helped to involve the community in the program.

*The *matrone* is a sort of midwife. A hundred of them have received basic training in vaccination and hygiene measures, particularly during childbirth. *Houngans* are voodoo priests. Leaf-doctors prescribe treatments based on herbs and plants. *Piqûristes* give all sorts of injections; they are the closest to modern medical practitioners.

The Meilleur and Grand-Goâve areas each have a health centre and a hospital. However, the population is so spread out and the access to these centres so difficult — because of long distances, a lack of roads or paths and a very uneven terrain — that it is essential to bring the services closer to the population. Ten “assembly points”, each serving 1000 inhabitants, have therefore been set up in each area in a location accessible from neighbouring villages. Generally, a house is provided or loaned by the community for this end.

About every three months (the inhabitants are directly informed as to the date and place by the assistants), a team also made up of professionals from the health centre and the hospital visits these assembly points. Its task is essentially one of immunizing against the main communicable diseases, but it also assumes innumerable other duties, from health education to prenatal consultation. In addition, it weighs, measures, and examines all children under five, and records this information on cards specially designed for this use, which show in graphic form “the path to health”. These are returned to the mothers, who can thus follow the growth of their child and detect the first signs of malnutrition. The team also distributes medicines and contraceptive materials. Finally, it gives emergency care as required, and directs cases needing more complicated treatment to the clinics and hospitals.

In this way, the team complements the activities of the health centre and the hospital, bringing to distant populations some of the services that are available to people living close to one of these institutions. What characterizes the PISP approach and gives it its strength is its extreme flexibility and mobility. It can, with the help of locally recruited citizens, dispense many services under practically any conditions, or at any location, as the assembly points can be moved both in time and space.

Among the other health interventions, there is the nutritional program already mentioned in the introduction, characterized by the distribution of enriched milk and the operation of two nutritional rehabilitation centres and several household demonstration programs.

Training is an essential aspect of an experimental project of this kind. It creates the conditions for, and, as well, provides proof of the project's success. With experience, the personnel trained for the project increase their effectiveness and competence, and help to disseminate health and hygiene information as well as train other assistants, educators, medical auxiliaries, etc. In this respect, the PISP's scoresheet is impressive. Apart from all the staff directly attached to PISP — the community officers and assistants, enumerators, nurses, paramedical nutritionists, and so on — who had been trained from the outset, some 100 *matrones* and 30

healers have so far completed a training program with apparent success.

Another essential aspect, and one inseparable from the previous one, is research. The originality and interdisciplinary nature of PISP show up most clearly here. The doctors, the sociologist, and the demographer collaborate in conducting a range of investigations on disease, intestinal parasites, fertility, mortality, traditional medicine, community animation, etc. One of DHF's major concerns is the dissemination — first to the Haitian medical and paramedical personnel, but also to a much larger public — of all these medical, demographic, socioeconomic and sociological studies, that aim primarily at identifying the best means of improving the general health conditions of rural populations.

And the results? One of the most apparent, and by no means the least important, is that the inhabitants are made aware of the benefits of community activities and development. PISP has given new life to the old community councils, and has contributed to the formation of others. Some of these have even joined together with a view to undertaking regional projects such as road construction, fighting erosion and deforestation, or establishing a community pharmacy and a school of home economics. It could be said that these are spinoffs of the PISP project. More directly, it has succeeded in eradicating whooping cough and neonatal tetanus, formerly the prime causes of infant mortality in the area. At this time, 90 percent of the target population are immunized against the main diseases,

notably tuberculosis, diphtheria, typhoid and whooping cough, and 70 percent against tetanus. Family planning, badly received at first, is beginning to be practised by more and more people, and the use of contraceptives is increasing. Malnutrition itself, in spite of two terrible years of drought in 1975 and 1976, appears to be on the decline, if not in percentage terms, then certainly in severity.

These improvements were not made without some difficulties. The most important was the lack of motivation and cooperation of some populations who had become sceptical because of the frequent absenteeism of the medical personnel. The technique of making the health centre personnel into true, mobile, community teams also has some weaknesses; as soon as the visits become irregular, community animation becomes very difficult, both for family planning and nutrition programs.

These successes and difficulties point up how important it is to obtain the participation of all concerned; from the populations served and the medical personnel to the community officers and assistants. Motivation and education seem to have been the key words for the activities undertaken by the staff of the project. They are convinced that community medicine has become an imperative in the developing countries, and that only other projects of this type, which earn broad local support, will succeed in solving problems of health or development in general.

And after all, are they not proving it by example in Petit-Goâve, Haiti? □



A baby is inoculated. Ninety percent of the population in the project area have been immunized against the main diseases.

Although mankind was supposed to have shifted from pastoralism to settled agriculture ten thousand years ago, there are still some seven million people in East Africa who are nomadic pastoralists. They include some two million Somali nomads who follow the rains and grass, heedless of the political borders of Somalia, Kenya, and Ethiopia. Also included are the Masais, who regularly cross the "closed" Kenya-Tanzania border; the Turkanas, Samburus, Pokots, and Boranas in Kenya; the Nuers in Ethiopia; the Dinkas in the Sudan; the Karamojas of Uganda; and the Lunda-Luvale of Zambia.

Advances in veterinary medicine, availability of water through bore holes, the increased demand for meat and commercialization of cattle herding have expanded the migratory herds of nomadic pastoralists. The large herds have exceeded the carrying capacity of the rangelands, which have also decreased in size as settled agriculture has expanded. The "drought with the long tail", which swept through Sahelian Africa, finally reached East Africa in 1972-1975. One of the countries hardest hit by the drought was Somalia, where close to three-quarters of the population are still nomads.

In 1973-1974, neither the short rains nor the long rains came to Somalia. The resulting drought devastated the herds of nomadic pastoralists. The Somali Government reacted to the emergency by setting up 20 relief camps. More than 268,000 pastoralists had flocked to these camps by May 1975.

The rains returned in 1976 and many of the nomads returned to the rangelands to build up their herds once more. However, fearing that another drought might come, and deciding to turn a disaster into an opportunity, the Somali Government organized a nomad resettlement effort. Planners estimated that the rangelands in their denuded state would be able to absorb only 128,000 nomads. Some 105,000 nomads would have to be resettled in agricultural and fishing communities as others spontaneously found their way into cities and towns.

With assistance from the Kuwait Fund and the World Bank, Somalia has set up three agricultural communities in Kurtun Waarey, Sablaale, and Dujuma, and three fishing communities in Brava, Adalle, and Eyl. The agricultural settlements were designed for commercial agriculture planted to sesame seeds, rice, bananas, corn, and a variety of cash crops. They range in size from 23,000 people in Kurtun Waarey to more than 40,000 in Dujuma. The settlements are planned as self-contained units, with the communities clustered around schools, a hospital, and community centres. Vast irrigated fields surround them. Huge pumps throb late into the night, bringing precious water from the Juba and Shabeli rivers to the green fields. The soil is fertile: these lands are being brought

Somalia

Nomads no more

A.A. Laquian

under cultivation for the first time, and the silt from the rivers has enriched the soil for centuries.

Amazingly, the fishing communities on the shores of the Indian Ocean seem to have thrived much faster than the agricultural settlements. In Brava, officials of the Fisheries Department report that former nomads were swimming in the ocean in less than a week. People were able to overcome their aversion to eating fish very quickly and acquired fishing skills in no time at all. Social scientists speculate that the rapid adjustment to fishing as a way of life may be due to the fact that the previous experiences of the nomads did not include fishing. Until they were brought to the fishing communities, almost none of the nomads had even seen the ocean. Without prior knowledge of fishing as a way of life, no negative stereotypes and taboos were acquired by the nomads. In contrast, the pastoralists have always looked at agriculture as a grubby occupation. Among the Masai, in fact, it is practically a sin to break the soil, as the earth is the source of grass, which is the

food of much valued cattle. Besides, as one farmer nomad was heard to comment in Adalle, "the sea is just like the desert, when one is in a boat and there is nothing else but space, the sun and the sky".

Cultural transition was helped in the agricultural settlements somewhat in that commercial farming, as practised in the settlements, is vastly different from the subsistence agriculture so despised by nomads. The ground in the settlements is broken up by huge tractors and irrigation canals are dug by gigantic digging machines. The crops planted are unfamiliar to the nomads, a fact that really does not matter, it seems, because they are destined for foreign markets. The irrigation pumps disgorge vast amounts of water, which in the rangelands had to be dug up and scooped out of dry riverbeds. Most important of all in the agricultural communities, is that there are practically no cattle, although an occasional sheep or goat, perhaps a family pet, may be found loitering around.

From a social science viewpoint, the



The author (centre) with a Turkana family in Kenya. Although the Turkanas are still largely nomadic pastoralists, this family has given up its traditional way of life and settled on a corn farm.

transition from nomadic pastoralism to settled agriculture and fishing constitutes a radical change process that if properly understood may provide knowledge and insights useful in designing development programs. This is the reason why IDRC is interested in supporting Somali social scientists who have proposed to study what is happening in the new settlements.

From the time the nomads were picked up from the refugee camps, loaded into airplanes, flown to Mogadishu, trucked to the settlements, and then housed in tents there, their lives were a dizzying process of change. Where on the rangelands the nomads subsisted mainly on milk, wild plants, and the occasional meat, they were now fed with Canadian wheat, American powdered eggs, Australian cheese, and Uruguayan corned beef — courtesy of the UN World Food Programme. The open rangelands became the confines of the camp perimeter. Mobile tents of sticks and skin were replaced by huts of reed and the occasional plastic sheet or old tarpaulin. The nomads now rode in lorries and tractor-trailers instead of on camels and donkeys. The dry desert heat of the northern rangelands gave way to the humid clamminess of the southern river valleys.

Many of the changes were consciously introduced by government officials to radically alter the life of the former nomads. Nomad families were organized into units of ten, gathered together in a cluster of huts. The 10-family units were then organized at a higher level of 50 families, then into sectors of 100 families and zones of 400 families. Leaders of these various organizational levels were chosen by elections. Responsibility for health, education, farm work, skills training, etc., was lodged in specific leaders.

If someone is sick, the leader must make sure he or she is treated in the clinic or hospital. No woman is allowed to give birth at home, only in the hospital. The leader must make sure that all school age children are in school. Leaders also organize work groups and community activities.

In the nomadic society, loyalty was to the clan. When the nomads were re-organized, the government decided that families from various clans would be mixed up in the new social units so that "tribalism" would be eroded. Economic transactions, instead of being valued in cattle, camel, sheep, and goats, are now reckoned in Somali shillings. A herdsman does not slowly build up his herd so that he can become prosperous and "buy" more wives. He receives "pocket money" from the Settlement Development Agency (SDA) instead, commensurate to the time he spends working in the fields, raising crops he will not eat, shipped to areas he does not know. Even the tradition of the "bride price" has been abolished. An old man in Kurtun Waarey sadly sighs — "look at

all those beautiful one-hundred-camel maidens working in the fields; now they will only fall in love and get married and not bring wealth to their poor fathers".

What have been the reactions of the former nomads to these changes? For one, they have not "voted with their feet" by leaving the settlements. An SDA official, peeved by the persistent insinuations of a foreign visitor, quietly asks; "do you see a fence around the settlement, armed guards to keep the people from leaving?" A census of all families has been kept by the SDA since the communities were set up. Figures show that about 10 percent of the original settlers have left, most of these returning to the rangelands. Those who left tended to be the richer nomads, who had provided insurance for themselves by "loaning" cattle and camels to relatives and friends. They now feel that with the return of the rains, they can start the painstaking process of building up their herds again.

For most of the settlers, however, the drought has finished off their herds. Life in the new settlement, though initially strange, has provided the certainty of food, shelter, medical help, education for the children, and most important of all, income. Many of the settlers still know where the herds are — they periodically disappear from the settlement to heed family obligations or participate in clan celebrations. But they always return, somehow.

At times, problems and misunderstandings have occurred between the former nomads and the settlement agency. The proud nomads grumbled about having to line up, calabash gourd in hand, for food rations. The SDA, upon learning the complaint, quickly changed procedures by making the leaders in the 10-family units responsible for food distribution, and by rotating distribution of food on different days. When the nomads complained about the fact that they were not compensated for their labour, the agency started giving them "pocket money" (not wages, for the resources of the government are still insufficient to pay regular wages).

At present, the settlement agency is formulating plans for "revillagization" — the distribution of people among carefully planned communities that will become the local government units in the area. Each community is being established around a public service area where there will be a school, health centre, community meeting place, and other government facilities. Families will be allocated residential plots and farmlands so they can grow their own food nearby. The commercial farms, however, will probably continue to be the source of paid employment, although it is hoped that people will be able to supplement their incomes by nonagricultural pursuits such as handicrafts, trade, and even small scale industries. The goal is to completely transform the nomad's world view so that they will be nomads

no more.

There are those who say of the nomad resettlement program that it is inhumanely changing a people's way of life and not respecting their cultural identity. To these criticisms, officials in Somalia point out that the program was a response to the crisis brought about by the long drought, and insurance against the day when the drought will come again. Most of the nomads were rendered destitute by the loss of their herds. The drought responsible for this was largely due to ecological changes that could be attributed to the rapid increase in people and animals in the badly denuded rangelands. Paradoxically, if pastoral nomadism is to be preserved as a way of life, some of the nomads have to be taken out of the rangelands to ease the ecological pressures.

Government planners in Somalia estimate that 65 percent of the country's 3.2 million people are nomadic or seminomadic pastoralists. They figure that from 1977 to 1981, some 186,000 more people will be added to this group by natural increase and migration. They hope that the number of nomadic and seminomadic pastoralists can be kept at their current levels or even reduced, which can only be done by encouraging nomads to join the agricultural sector. This, in turn, can best be done by moving the "excess" nomads to agricultural settlements.

Somalia, as a nation, is lucky in having a common identity that is enhanced by a common language, Islam as a religion, and a deep sense of tradition and history. Unlike many other countries in Africa, Somalia is not plagued by ethnic and other divisions (even the danger of "tribalism" in Somalia refers to differences among clans rather than real tribes). Somali leaders are mightily trying to achieve the benefits of modernization in the shortest time possible. It is in this connection that they are confronting the most important development reality in their country, that of nomadic pastoralism. Rightly or wrongly, Somali leaders are enthusiastically trying to preserve a viable pastoral society on the one hand and create an agricultural and industrial society on the other. The studies of pastoral nomadism proposed by Somali social scientists for IDRC support will not merely be passive notations on processes of social change. If carried out properly, they will serve to evaluate the effects and impact of the resettlement program on the nomads, their communities, and Somali society as a whole, in the hope that with the help of new knowledge, the nation's goals can be effectively achieved. □

Dr A.A. Laquian is Project Director of the Social Sciences and Human Resources Division at IDRC's Regional Office in Nairobi, Kenya.

Report from the field: news needed from the food front

B.H.S. Jayewardene

We live in times when feeding the world's growing population is receiving the highest priority. Agricultural growth must provide not only more and better quality food but also more incomes and jobs. In Sri Lanka, where the population has doubled in the 30 years since independence, agricultural production and food have been the preoccupation of successive governments for the past three decades.

Yet, journalism in Sri Lanka has paid little attention to developing specialized food and agricultural reporting and decision-makers have yet to realize the importance of background information, of explaining and interpreting agricultural developments and food problems.

Regular use of mass media for the dissemination of news and information on agriculture on a planned basis has been lacking. This is particularly tragic in a country like Sri Lanka, which has a high literacy rate. In fact, a recent survey conducted by the Research division of the Department of Information revealed that 90 percent of those questioned in a sample survey had heard about the government's five Year Plan through the newspapers.

A Marga Institute survey commented that "The popularity of newspaper reading revealed in a readership survey indicates the desire among the selected groups to gain access to whatever information that is available". According to the survey, newspaper features are widely read. They serve as a source of knowledge on current affairs.

It is therefore difficult to explain the failure of successive governments to use the media for disseminating information relating to one of the fundamental sectors of our economy; the failure of successive owners of newspapers to orient their publications to give greater prominence to stories and features relating to food and agriculture, and, the failure of journalists to concentrate, to at least some degree, on these fields.

Mass media, apart from merely disseminating information, creating widespread awareness on a subject, and imparting education, also play the important role of "agenda setting." That is, the mass media, quite unobtrusively, pick the subjects for the days discussions, in the bus and train, in the office canteen, the wayside pub, and in clubs and homes. They could turn discussions

to a crop failure in the rice bowl or an epidemic of hoof and mouth in the eastern province. The newspapers could provide the causes of these events and explain how they can be avoided.

Let us take the recent epidemic of hoof and mouth disease. My colleagues living in Sri Lanka will tell you that they have avoided meat for some weeks. But news of the disease was only made public many weeks after the epidemic had taken a heavy toll of cattle in various parts of the country.

Again, let us take the case of international agricultural conferences. Sri Lanka is well represented at all these conferences, often at ministerial level. But little publicity is given to the deliberations, and the decisions and benefits derived by Sri Lanka are never communicated in popular language. The officials keep them secret.

It is the duty of the journalist to dig in and get the news. But he must have the data, in whatever jargon, before he can decode it for the nonprofessional audience. Obtaining the information is never easy.

Two attitudes are responsible for the reticence of officials to convey such information. First, officials generally believe that the average citizen is not interested in the humdrum developments of agriculture and food. Second, there is a general tendency, particularly on the part of officials and researchers, to treat scientific data and basic information as their exclusive domain. Even where there is an interest in publicity it often takes the form of projecting the individual rather than the information. Rarely are details of research routinely made available to the mass media. The only time the research institutes become media conscious is when faced with a crisis.

It is here that the newspaper journalist has a role to play. It is his function to interpret in the language of the common man, the farmer and backyard poultry keeper, the facts and secrets of these fields. Few journalists have specialized in the fields of agriculture and food in Sri Lanka. It is natural that they have not. They would do so only if their work can get play in the newspaper, and it has generally been the pattern that such stories have to fight their way into print. Until recently, and to an extent even today, such stories receive only inside

page rating.

Agriculture and food reporting covers a broad spectrum of activity — climate, fertilizer, pesticides, tractors and equipment, storage facilities, and transport. Also worthy of reporting are bureaucratic bottlenecks. In most developing countries, availability of food has generally been in inverse proportion to the efficient functioning of the bureaucracy. A journalist on the food front must be able to relate breakdowns in any of these sectors to the overall picture of the nation's food problems. His comment and analyses will then forewarn the authorities of an impending crisis.

News about food and agriculture in the local press originates principally from government sources. Handouts from the information department and from the various Ministries give details of specific projects generally relating to a Minister's visit, an opening ceremony, or some other such event. These are either reproduced *in toto* or rewritten as news stories, without being linked to other events.

There is also a lack of follow-up. What happened to a project that was started? What will its impact be on the district in which it is sited and on the country as a whole? These are jobs for the trained journalist. Here a degree of specialization is necessary.

There are a number of institutions dealing specifically with matters concerning food production that have not been tapped sufficiently by the media. In Sri Lanka we have an Agrarian Research and Training Institute, and Agrarian Economic Research Unit in the Peradeniya Campus; institutes such as the Central Bank, the National Institute of Management, and the Marga Institute, which undertake occasional studies relating to agriculture and food production. The findings of these organizations are seldom placed before the public.

One of the reasons for this is the belief that the journalist is not competent to explain the research and the recommendations of these organizations to the newspaper reader, that the expert alone is able to do so. Although the Sri Lankan journalist is as competent as his counterpart in other countries, the attitude of the experts would seem to be justified by one fact alone — his lack of training.

The Sri Lankan journalist has been left high and dry, little affected by the

Drug abuse a growing problem in West Africa

Jean-Marc Fleury

currents of change that mark the progress of media and communication today. He has no formal training in his own professional requirements, let alone specialist training in fields such as agriculture and food reporting.

Whatever professional training is available is confined to an exclusive elite who have been fortunate enough to receive a Commonwealth Press Union scholarship, a stint at the East-West Center, a scholarship in a European country or a Dag Hammarskjöld Fellowship.

Even these journalistic jaunts are not exploited by newspaper employers or editors. After their return, these journalists do not receive assignments that are a challenge to the specialized training they have received, assignments, for instance, that combine research and investigative reporting, or even passing on their newfound experience and skills to junior members of the editorial staff.

In this context it would be valuable if this seminar could specifically underline the need for setting up training programs for third world journalists. Since the non-aligned summit of 1976 and the call for a new International Economic order was made, opinion has crystallized that a Third World News Pool is necessary and that the exchange of journalists between developing countries should be encouraged. The sorry state of food reporting in Sri Lanka should serve as a strong point in the case being made for specialized training for the Third World journalist.

The sooner this kind of training is provided the better for countries like Sri Lanka. The journalist will then be recognized by the "experts" and the intellectual elite, and through him the citizen will understand the changes and developments now sweeping the globe in the food and agricultural sectors. □

Mr B.H.S. Jayewardene is editor of the Ceylon Daily News. This article summarizes his keynote address to some 30 journalists attending a recent seminar on Food and Agricultural Reporting, co-sponsored by the Asian Mass Communication and Information Centre (AMIC) and IDRC in Colombo, Sri Lanka.

African teachers are worried. A growing number of their students are taking up the use of drugs. Because of the nature of their contacts with young people, teachers are often the first to observe the damage caused by the abuse of narcotics, and to become alarmed about the drug dependence of increasing numbers of adolescents. A study prepared by the World Confederation of Organizations of the Teaching Profession (WCOTP) in connection with a meeting in Lomé, Togo, on education concerning drug abuse problems in six African countries sets forth the concerns of the teachers and the preventive measures they recommend.

The study summarizes the observations and opinions of teachers from six countries at varying stages of development: Cameroon (annual per capita income: US \$304), Kenya (\$183), Nigeria (\$211), Senegal (\$234), Sierra Leone (\$198), and Togo (\$133). These countries also differ in religion (about 80 percent of Senegalese have been converted to Islam), and in their traditions respecting the use of drugs. The Islamic religion of the vast majority of Senegalese forbids the consumption of alcohol, while in some areas of Sierra Leone it is traditional to encourage young children to drink it. In both Senegal and Togo, consumption of *yamba* (Indian hemp or cannabis) is an integral part of the traditional rites and ceremonies of a number of tribes. Other local products such as *kola*, in Cameroon and Togo, and *kat* in Kenya, also have a long tradition of use.

In some countries, access to imported products in addition to locally available drugs has multiplied the temptations for young people, especially those from wealthier families. The WCOTP report does not attempt to draw up an exhaustive inventory of the drugs used by young Africans, but the list of products used corresponds closely to that of the industrialized countries. Among drugs that can produce dependence, the study cites the opiates (opium, morphine, heroin), sedatives (barbiturates), stimulants (amphetamines, *kola* and *kat*), hallucinogens (cannabis and LSD) and one intoxicant, alcohol. The report did not classify tobacco among those substances that produce dependence, although it pointed out that its mode of use was considered to be habit-forming.

In general it is cannabis, most often consumed in the form of cigarettes, that causes the greatest concern. Since growing cannabis is traditional in Senegal and Togo, among other countries, the cultural environment sometimes makes any control measures difficult, although its use in schools and universities in Senegal has not reached alarming proportions. Elsewhere, cannabis is beginning to pose serious problems. In Sierra Leone, for example, some families have no source of income apart from the sale of *diamba*, and in Nigeria, the government is trying to reduce the great popularity of this hallucinogen called variously *wee-wee*, *igbo* or *grass*.

Teachers are worried that the bright promise of many children, like these in Sierra Leone, will be dimmed through drug abuse.



Photo: Neill McKee

In the less developed regions, it is consumption of local herbs and leaves with narcotic properties that may bring dependence. The study notes this drug use pattern is of special importance in Togo. In countries more exposed to outside influences, however, imported synthetic drugs are gaining popularity. In Kenya, Cameroon, and Nigeria the use of amphetamines is steadily growing. Students in Nigeria particularly have surprised their teachers with their extensive knowledge of drugs. Many Nigerian students apparently turn to amphetamines for the stimulation they need in order to work long hours during examination times. The teachers deplore the serious disorders that ensue when the stimulant user also takes barbiturates to recover lost sleep, says the study.

Easily available drugs such as alcohol and tobacco are also a subject of concern. All the WCOTF countries observed an alarming increase in alcohol consumption. In Sierra Leone, for example, 64 percent of the students questioned consumed alcoholic beverages. As it is customary in some tribes of that country to give children palm wine, the teachers say they are not surprised that young people there acquire intemperate habits very early. Reports from all quarters also express the alarm of the teaching profession at the rise of "tabaccoism." In Cameroon, for example, tobacco use is endemic in the group between 8 and 20 years of age. Fortunately, say the teachers, the battle against tobacco is easier to wage because smoking can be forbidden on school premises.

It is often said that drugs ease the pangs of hunger. Field workers in the West Indies, for example, smoke marijuana for this reason. Drug use among peasants and the powerless poor does not generally produce the same sort of concern as when it affects middle class youth. When drug use makes inroads with the sort of young people fortunate enough to be able to go to school, rather than work the fields, the authorities become alarmed.

Drug use among relatively affluent youth is seen as a sign of general disaffection with the social order created by their elders. The problem of drug abuse among students appears all the more disturbing for the reason that it chiefly affects the wealthiest families in countries considered most advanced.

The teachers do not try to make an indepth analysis of the reasons that lead so many young Africans to abuse drugs. They mention only the school-related reasons with which they are familiar. First among them is assumed to be students' need for extra energy in order to stay awake to prepare for exams. In addition, many have fallen into the drug trap because they lack discipline, or in order to forget their apathy towards their studies or an imagined academic backwardness. Finally, all the participants surveyed stated that an important cause of drug abuse among the young is the poor example set by their parents and, all too often, by the teachers themselves.

Nevertheless, parents, teachers, church authorities, and government officials are becoming increasingly sensitive to the problem. In Nigeria, parents are preoccupied with the "drug plague", and have asked public authorities to take action. Some teachers, in particular those in Lagos State, have set up a commission of inquiry into drug dependence. Following a number of public demonstrations against drug abuse in the schools, the Nigerian authorities have passed a number of laws and ordinances aimed at combatting the manufacture, distribution, importation, and abuse of dangerous drugs.

For their part, some parents in Kenya admit that they have often drunk alcohol or smoked *bhang* or opium in the presence of their school age children. Some even admit to having sent their children to obtain drugs for them. Still others say they have distilled or illegally prepared *chang'aa* (Nubian gin) with the help of their children. Ironically, some of the money obtained from the sale of this drink goes for the children's education.

Most parents vigorously denounce drug dependence in school children. The Department of Education in Kenya has been called upon to take action against the opium, cannabis, and alcohol habits that seem to be taking hold in the schools. From 2 to 5 percent of primary school children and 3 to 10 percent of secondary school students are said to smoke cannabis, hashish, opium, and tobacco regularly, while three

to four times more consume alcohol. The teachers' association in Kenya has condemned the abuse of drugs, and has not hesitated to denounce those of its own members who are setting a bad example. The influence of foreign teachers, some of whom the study describes as "tourists in disguise", has apparently been harmful to some.

In Togo, drug abuse is not a significant problem, but there is a fear that the number of users will grow. Authorities in Senegal are not yet facing a grave situation either, but consider the danger of enslavement to drugs very serious, because the traditional physical, mental, and spiritual strengths of the population would be threatened. In Senegal, religion is a significant brake on abuse, as the use of drugs is held to be contrary to the principles of the Koran. In the Tijaniyya sect, which comprises half the Moslem population, this interdiction extends even to tobacco.

In Sierra Leone, according to the study, many parents do not even realize there is a problem and are often victims of their own ignorance. Others understand but do not have the resources to do anything, while a large number of parents simply resign themselves to the problem. The Sierra Leone teachers taking part in the study said they were disappointed that their country was doing so little to tackle the problem, but the teachers' association itself has not yet made any public expression of its opinions on the question, neither policy position nor publication. In Cameroon also, teachers consider their own action less than satisfactory.

The delegations from all countries agreed that the situation was getting worse, and that a policy directed at arresting the current drug use trends was essential. The study recommends that such a policy should be based on education and suppression.

As a first step, the study recommends educating the teachers themselves. Often they do not have the training necessary to assess the seriousness of the problem, or to make distinction between an accidental overdose of drugs and the sort of drug abuse that leads to addiction. Next, the teachers must inform the students. For example, in Senegal, where the battle seems to be most concerted, authorities depend to a great extent on moral and civic education to put children on their guard against the dangers of alcohol, tobacco, and "hard" drugs. In Kenya, the Department of Education makes use of the "Voice of Kenya" to present a radio program on drug abuse, but the teachers feel that this is not enough.

With regard to measures for suppression, participants in the study recommended the enactment of legislation to counter the consumption of illicit drugs. Some young people who have been given a "dissuasive sentence" say very frankly that they have never heard anything that might make them aware of the dangerous consequences of drug dependence. Drugs have been a major problem in Nigeria for the last 15 years, but it is only very recently that the serious social repercussions have been recognized. Significant efforts are now being deployed in that country to eliminate illicit hard drugs. A narcotics control division has been set up with the federal Department of Health, and drug control committees have been established in various states and cities. The department is responsible for formulating precise guidelines for doctors, pharmacists, and health institutions, while local committees direct the efforts of teachers, volunteers, church people, and administrators. Senegal has adopted well-elaborated anti-drug legislation. The Department of Justice has in fact been given responsibility for a re-education program for young offenders.

The African teachers say they are prepared to do everything they can to stamp out debilitating drug abuse, but that they require the help of another, very influential group of educators — parents. □

Jean-Marc Fleury is a science writer with IDRC's Publications Division.

Harnessing energy for development

Energy. It is, very simply, the capacity to work, not valued for itself but as a means to an end. It is an historical fact that development, particularly economic growth, results largely from the substitution of different energies for muscle power in agricultural, industrial and domestic processes.

The industrialized countries are designed to run on oil. If developing countries spend vast amounts of scarce capital copying them, however, the petroleum era may well be over before the investment bears fruit. The crisis in the Third World is exacerbated by the fact that traditional energy sources — firewood, charcoal and forage for draft animals — are also growing scarce and expensive.

Yet, the way out of the dilemma for both developing and developed countries may well be through these tradi-

tional energy sources, grouped under the umbrella term "solar energy". Solar energy includes all sources of renewable energy, both direct use of the sun's radiation and indirect uses such as hydropower, windpower and biomass power.

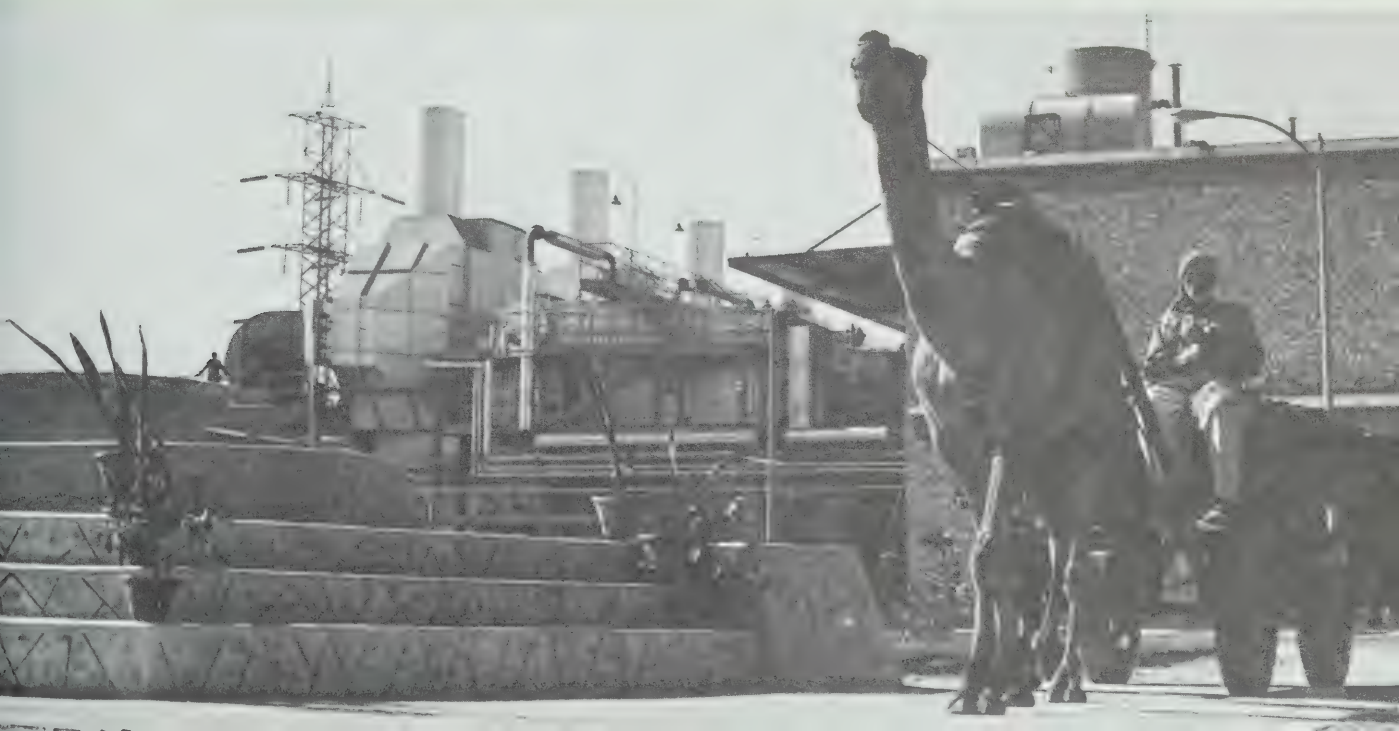
Most scientific world watchers have concluded that the developing countries will enter the solar era before the industrialized countries. They are well endowed with sunlight, for one thing, and their populations tend to be dispersed, thus facilitating solar exploitation. And, as they obtain much of their energy from solar sources today, the first step to a fully solar era should involve no more than an increase in the efficiency of usage.

How the energy can be harnessed more efficiently is a matter of technology. It is also a matter of conservation:

matching energy sources and quality to the use. And it is what the articles of this dossier explore: ways of using renewable energy sources to meet the basic needs of rural populations, from simple solar dryers to sophisticated photovoltaic cells.

A successful solar transition, however, will require detailed knowledge about energy availability and needs in the Third World as well as up to date information on research and development. And as Denis Hayes, author of *Rays of Hope: The Transition to a Post-Petroleum World*, points out in Worldwatch Paper 15, it requires fundamentally that the transition to alternate sources of energy be begun early enough, and be pursued vigorously in order to have a viable system in place by the time it is needed.

Photo: CIDA



Exploiting the desert's energy resource

Narendra Aggarwal

More solar energy reaches the Great Indian desert than many areas closer to the equator. Energy inflow from the sun into the desert is, on average, 275 watts per square metre. This is because clear skies and better atmospheric conditions over the desert permit more solar radiation to reach the land.

This unending source of energy offers a great potential for reducing the miseries that desert conditions impose on the large populations that inhabit the Indian desert.

Known as the Thar desert, this area is unique in that it is the most densely populated in the world. Covering about 28,600 sq km in the northwest of the Indian continent, it spreads over more than half of Rajasthan State. Population density varies from four persons per sq km in Jaisalmer to 157 per sq km in Jhunjhunu. Between 1901 and 1971, its population increased by 158 percent to 8.84 million. The current estimate is about 10 million.

India is blessed with abundant solar energy, estimated to have a daily value of 5.5 kilovolts per square metre. The quantum of energy received by Rajasthan State alone is more than sufficient to meet the world's annual energy demands.

Realizing the potential of this source of energy, the Central Arid Zone Research Institute (CAZRI) at Jodhpur in the Rajasthan desert is engaged in solar energy utilization research and has achieved early success, although on a modest scale.

It has started a new research project on biogas plants with the objective of maximizing gas production in the winter months and on cloudy days when the amount of solar energy reaching the plant is reduced. To begin, the glass-house approach is being tried. The gas plant has been enclosed in thick polythene, thus keeping out desert winds and trapping solar energy for more effective gas generation.

Scientists at the Institute have another simple method for raising gas production. Water heated through a solar water heater is used to make the slurry of gobar

(cow dung) for feeding into the plant. Thus additional solar energy is fed into the plant resulting in increased gas generation.

Recently a solar water heater cum solar steam cooker has been developed. Consisting of a flat plate collector, a storage tank, and a steam cooker, it can supply 100 litres of water at 60-70°C during winter afternoons, and 50-60°C the next morning. Trials have shown that it can be used for cooking or boiling cereals, rice, potatoes, lentils, vegetables, etc. Two cooking vessels can be placed side by side and 1 kg of rice or potatoes can be boiled within 90 minutes.

The main raw materials used in this system — pipes, plane sheets, aluminium angle, fiberglass insulation, glass sheets, etc. — are all easily available. It costs us\$150, including material and labour.

Sun drying agricultural produce to preserve it as seed, food, or animal feed is an ancient practice in most parts of the world. This is the simplest form of solar energy use. But if a little solar technology is applied, a considerable amount of spoilage can be eliminated, and fuel and electricity saved.

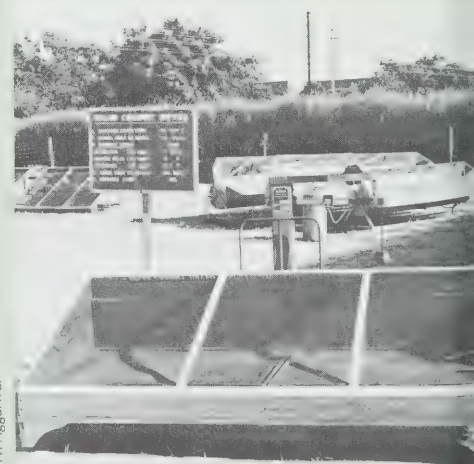
The solar cabinet dryer fabricated at CAZRI is essentially a solar hot box in which fruits, vegetables, or anything else can be dehydrated on a small scale. It consists of a rectangular wooden box with an insulated base area of 1.5 metre square, covered with clear glass tilted at an angle of 23 degrees. Holes are drilled in the base for fresh air to enter. The humid air escapes through outlets in the upper side of the cabinet.

Maximum air temperatures in the empty dryer vary from 55 to 95°C. Under Jodhpur conditions, 15 kg of chillies and 15 kg of dates were dehydrated, and 15 kg of grapes were converted into raisins, in two to four days. The solar cabinet costs only us\$35. Permanent large solar dryers can be made from bricks, stones, or concrete.

Five different types of solar cookers were field tested at the Institute and it was found that the solar oven was best



The solar water heater and steam cooker developed at CAZRI supplies water at 70°C and can cook one kilogram of rice in 90 minutes.



Photos: N. Aggarwal

This solar cabinet dryer, one of five different types field-tested at CAZRI, is essentially a hot box in which fruits, vegetables and other produce can be dehydrated.

for the desert. It consists of a well insulated semi-cylindrical box made of aluminum and wood. The interior is painted black. The window has two transparent glass sheets. Eight reflectors made of silvered glass mirrors are also used. The oven costs US\$40 and it can be manually tilted and oriented towards the sun.

On very clear days, maximum plate temperature in the oven reaches 350°C during the summer, 250°C in the winter. Practically all foods can be cooked, roasted, baked, or boiled within 25 to 75 minutes. This solar oven is highly efficient as its performance is not affected by winds and there are no chances of dust falling in the cooking pot. Moreover, the food remains warm even after sunset if kept inside the cooker.

A built-in storage type solar water heater that is cheap, efficient, and useful for both rural as well as urban areas has also been developed at the CAZRI. It consists of a rectangular tank, which holds about 90 litres of water. This tank performs the dual function of absorbing the heat and storing the heated water. It is encased in a tray, insulated at the back and sides, and covered with glass. The front face of the absorber tank is painted black to absorb the maximum solar radiation.

On winter afternoons, 90 litres of water can be heated to 50-60°C, while in summer the temperature of the water rises to 60-80°C. By using a reflector/insulator cover, the water temperature can be raised further.

Fresh water collection in arid, semi-arid, and coastal areas that are thinly populated is a time-consuming exercise as it has to be brought from far-off places. In these areas solar energy is plentiful and can be used for converting saline water into distilled water. At CAZRI, experimental solar stills have been fabricated and are being tested. Including the capital cost, depreciation cost, maintenance cost, and interest on investment, the cost of distilled water comes to only US35 cents per 100 litres. □

Narenda Aggarwal is staff correspondent for the Hindustan Times, New Delhi, India.

Crop drying: something new under the sun

Solar drying of crops is an age-old method of food preservation practiced around the world. But the traditional method of spreading the crops on the ground, while inexpensive and relatively effective, often results in significant losses. During the rainy season, it also results in a product with a high moisture content that spoils quickly.

In recent years, attempts have been made to increase the effectiveness of traditional sun drying techniques in order to make better use of sun and wind, obtain a higher quality produce, and reduce contamination by dust and insects and the dangers of incomplete drying.

The postproduction group of IDRC's Agriculture, Food and Nutrition Sciences Division is encouraging several novel approaches to crop drying using sun and wind as the principal sources of energy. Here are some examples:

- Cassava is a staple food crop in many Southeast Asian countries and, in the form of starch, pellets, and chips, is an important export commodity. Processing generally involves chopping the roots by hand or by machine, then spreading the pieces to dry on a concrete floor.

As part of an IDRC-supported project on cassava processing, experiments were carried out in Thailand on different sun drying techniques. It was found that thin slices or strips dried more quickly than chips. The drying time was considerably reduced when the cassava was spread on a black topped floor. Drying trays suspended above ground were also found to be effective because they permitted greater air circulation.

- The cultivated area of Egypt is only about four percent of the total land area. This area lies along the Nile river whereas the consumers of the products are scattered throughout the country, thus necessitating extensive transportation.

As Egypt enjoys intensive sunshine — 3600 hours a year on average — solar drying is widely practiced. The present method of spreading the produce on the ground, however, results in significant losses.

Late in 1977 the National Research Council of Egypt began work on developing methods for utilizing the available solar energy, at different latitudes, for drying agricultural produce and fish. After evaluating the drying requirements for the commodities (grapes, apricots, and fish) and recording the solar and atmospheric variables at Cairo and Fayoum, an agricultural community surrounding an oasis 100 km southwest of Cairo, three different designs of solar air heaters will be developed, each based on the solar flat plate principle but adapted to the specific needs of the commodities.

The dryers will be tested and compared to traditional methods. Other traditional sources of energy will be used to some extent in combination with the solar heater to develop the most economically advantageous dehydration unit.

- The introduction of new high-yielding rice varieties has made multiple cropping possible in Thailand and other Asian countries. Much of the benefit of this second crop is lost, however, as the farmer cannot dry it properly during the wet season and is forced to sell it quickly, at a low price, before it spoils.

The Asian Institute of Technology (AIT) in Bangkok has therefore designed a prototype solar rice dryer. Built on a mound of earth, it consists of a one square metre flat bed box made of wood and plywood, covered by a plastic sheet. A mosquito net serves as the floor. The air heater consists of a layer of burnt rice husks to absorb solar radiation, covered with clear plastic on a wooden framework to form an air duct. The entrance faces south, into the prevailing winds during the wet season.

The system functions by natural convection and heats the air passing over the solar collecting surface to 40-45°C. Tests have shown that in one to two days of sunny weather, 10 cm of wet paddy grains were dried to 14 percent moisture content — the level required for safe storage. In three to four days of cloudy weather, up to 20 cm of paddy was dried.

An IDRC grant will now enable AIT researchers to build and test a dryer suitable for a small farm and experiment with different materials and methods of construction.

- While carrying out a large-scale program of sorghum breeding, intercropping and preservation, researchers at the Centre national de recherches agronomiques (CNRA) in Bambey, Senegal, found that storage losses resulted largely from the poor quality of the grain stocked in the silos. The crops were generally sun dried in stacks in the fields where they suffered insect damage. The moisture content was also high.

The research team determined the angle of the sun for every day of the year and the direction of the prevailing winds. During trials it was found that the wind had a greater effect on crop drying than did the sun. They therefore built simple platforms, using local materials, and oriented them so that the heads of the unthreshed grain face into the wind. What they produced was simple solar cross-flow dryer that significantly reduces grain moisture.

Plugging in the sun

To
to meet

Bernard Méchin

A new type of water pump now in use in a number of developing countries could well provide the solution to many of the problems posed by cyclical periods of drought and the unreliable operation and maintenance of water pumping systems in the tropics.

The pump in question is a low-power solar water pump. Requiring only a day or two to install, it starts turning shortly after the sun rises, with its delivery increasing as the sun moves higher in the sky. As long as the sun rises each day, this solar pump can tap the most regular of the intermittent energy sources available. No human intervention is required to operate it, which reduces the risk of breakdowns. As there are few moving parts to change or replace, the cost of maintenance and operation is considerably reduced.

The solar pump operates on photovoltaic cells — silicon discs that directly transform the energy they receive from the sun into a continuous electrical current. The advantage of the system is obvious: the sun does all the work, and the energy produced is transmitted to an electric motor that operates a pump.

The capacity of the pump varies from 600 to 1300 watts. With this power, between 15,000 and 120,000 litres of water can be drawn daily, depending on the depth of the well. By guaranteeing a regular supply of water, the solar pump breaks the dry season-wet season agricultural cycle. This could eventually lead to steady production activities, curbing seasonal and permanent migration from the countryside and promoting economic activity in rural areas; farming, livestock raising, and the establishment of units of craftsmen and small agro-food industries. At the same time it will result in improved health through better nutrition among villagers, enabling them to plant vegetable gardens that will supply the vitamins they lack during the long dry season.

The main obstacle to more widespread adoption of this pump is its relatively high cost. The technology seems to have been perfected — 20 or so such pumps have already been working for a year or two with no apparent difficulties. But the cost of the photovoltaic cells, which represents 70 percent of the total investment, is decreasing by 15 to 20 percent yearly, and the total cost of a solar pump is constantly going down. It is predicted that solar generators might become economically competitive with diesel ones by 1980. Some see these forecasts as utopian, but the chances of realizing them are much greater in view of the fact that a new manufacturing process should soon enable photovoltaic cells to be made in a continuous strip in a single process. This would considerably lower their production cost, to the point where it may indeed be competitive.

Solar cells may in fact be the way of the future for more than simply pumping water. In the United States, construction began in May on a totally solar electric village power system using photovoltaic cells. The inhabitants of the Papago Indian village of Schuchuli, Arizona, face many of the same problems as villagers in developing countries. Lighting is by kerosene lamps, perishable foods and medicines cannot be stored, and water is pumped by a diesel engine that because of the cost of maintenance and fuel is a drain on their financial resources.

When completed later this fall, the 3-kilowatt solar electric power system will provide Schuchuli's 96 residents with sufficient electricity to power a community refrigerator, freezer, washing machine, sewing machine, water pumps, and lights for the village's 16 homes, church and feast house.

The application of solar electricity technology in the Arizona desert has implications for the more than three million villages without electrical power in the world today, most of them in developing countries. If scientists succeed in making solar cell electric power generating competitive with other means, the future may well belong to the sun.

The function of energy is to provide heat or perform work in specified situations. For the two billion rural people in developing countries who have very limited access to conventional energy sources such as electricity and petroleum, discussion of energy needs must begin with the question of what kind of heat and what type of work is needed.

One of the tasks that in developing countries routinely demands a large amount of work is the drawing and carrying of water. It is quite common in developing countries for women to spend 4 to 5 hours a day in simply obtaining water for household use. A researcher in East Africa has calculated that the women in one village expended 50 percent of their food energy intake in carrying water.

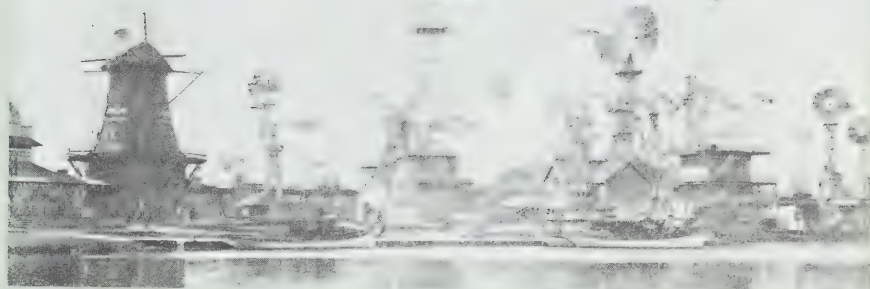
IDRC first became involved in research on the application of wind energy for water pumping at the request of the Ethiopia Water Resources Authority (EWRA). The managers of EWRA were confronted with a combined economic, logistic, and technical dilemma. The cost of operating diesel-powered rural pumping stations had increased dramatically, as had the problem of supplying and maintaining diesel pump sets in rural areas.

The first step in responding to this request was to conduct a review of the state-of-the-art of wind energy technology for water pumping. This review revealed that although a few conventional fan type windmills were still being manufactured in industrialized countries for farm use, the design had improved very little in the last 70 years.

In 1850, windmills in America used for pumping water and sawing wood represented 1.4 billion horsepower-hours of work, an amount equivalent to the energy produced by 11.83 million tons of coal. By 1910 there were about six million windmills of this type pumping water on American farms. The numbers declined steadily as rural electrification grew, but 150,000 remain in operation today. Australia still has 250,000 units in the field.

ng on the wind l energy needs

David Henry



A forest of windmills greeted visitors to the 1893 World Columbian Exposition in Chicago.

The state-of-the-art review revealed that the minimum cost of these conventional windmills was us\$3000, a cost level too high for practical consideration in developing countries. The field experience with this type of machine had not been encouraging, due largely to the complexity of the machine and the inadequate support system for maintenance and repair in villages in developing countries.

These generally unsuccessful attempts to introduce "industrialized" windpower technology in developing countries illustrated the need for a much more effective research and development system. As with much technology work, all too often windpower research focused exclusively on the technology of the machine. The interaction of the technology and the local community had been overlooked.

Shortly after the state-of-the-art review had been completed, we discovered the work that was being done by Armando Filippini, an Italian who had been working in Ethiopia for 20 years. Filippini had developed a novel vertical axis wind rotor designed for water pumping.

Because Filippini had done all his work in Ethiopia, using local materials and skills, his machine answered many of the crucial "local fabrication" questions. The design utilized sophisticated aerodynamic principles, but was at the same time rugged, simple to build, and could be fabricated at one tenth the cost of conventional fan type mills.

The next step towards development was to define the characteristics of the Filippini windrotor in a series of tests at the University of Waterloo in Canada. A study of the history of windmills revealed that there had never been a research project designed to optimize the efficiency of a windmill with various types of pumping systems. The Waterloo research project produced basic data on the subject, which is now being used by researchers in Ethiopia and Botswana to test the efficiency of different types of pumps in combination with the Filippini rotor in a field situation.

Windpower is not a universal solution

to rural energy needs. Before its potential can be defined, there must be a careful assessment of regional and local wind characteristics. This essential aspect of wind energy research is still in its embryonic stage.

The two windpower applications with the greatest potential for developing countries are in direct drive for powering water pumps and agricultural implements such as grain grinders and threshers, and in powering generators for electric conversion. The water pumping applications will likely see widespread use first, due primarily to the fact that the equipment can be locally fabricated from available materials, using local energy sources.

Wind electric systems, with their greater complexity, will appear at a later stage. To date, studies of these systems have generally been carried out in industrialized countries where large scale conventional electric power generating systems are in use. Assessments of the cost of wind electric systems have therefore been based on the principle of "power on demand", that is, when the switch is pulled, the lights *must* come on, and the motors *must* start running, without interruption.

In developing countries, it will be a considerable time before rural electrification grids reach all of the two billion villagers. The "power on demand" principle does not necessarily apply in the first stages of application of non-conventional power sources in the rural areas. For example, water pumped by a windmill need not be pumped at the time of peak demand. Water may be pumped in the middle of the night, if that is when the wind blows, and stored in a surface reservoir.

Estimating the cost of generating electricity from the wind is difficult, but many studies suggest that intermittent electricity could today be generated from the wind for considerably less than the cost of providing fuel for an oil-fired unit of the same capacity. Compared to conventional systems of power generation, wind electric systems become competitive when a \$1000 investment

delivers one horsepower — enough power to light 74 100-watt lightbulbs. Reliable wind electric systems in the 3 to 10 horsepower range, suitable for village applications, are available at that price. At present the largest commercially available wind electric unit generates 15 kw (20.1 horsepower).

Small generating devices have the advantage of requiring a much lower initial investment than conventional systems designed for large volume generation. They can also be located where power is needed, thus eliminating the need for vast power distribution networks.

The economics of windpower depend, however, on the local characteristics of the wind and on the needs of the population it will serve. Carrying out these assessments requires a new approach to determining the energy demands of rural people. Historically, the approach taken to meeting them has been supply oriented in the form of rural electric grids and diesel engines. Much more needs to be known about the type of demand villagers have, and how much they can afford to pay. At the same time as the demand end of the energy spectrum is being researched, it is essential that reliable data on the cost and efficiency of nonconventional energy sources be developed. This would then enable the technical and economic possibilities of power sources such as wind, solar, and biomass energy to be matched more effectively with local demand. □

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Conserving society demands new growth

The very term "Growth in a Conserving Society" has an optimistic ring to it. It suggests immediately that growth and the Conserving Society are compatible. I am convinced that a conserving society is the only one in which real growth can be sustained for any period of time, new employment opportunities created and the debilitating malaise of inflation overcome. This, of course, is easier said than done and we in Canada cannot do it in isolation.

No one will deny that the technological civilization that now dominates our planet is the direct product of economic growth. The belief that growth in the purely material sense would bring about a corresponding increase in human satisfaction and well-being has been the underlying premise of virtually every modern nation.

It has been true up to a point. The explosion of our capacity to produce a multitude of material goods and services that accompanied the industrial revolution brought unprecedented benefits to the peoples of the industrialized world. It has also made it technically possible to effect vast improvements in the conditions of life available to the entire human population.

It is through the growth process that we create the economic means for meeting our social needs, that we provide employment and make possible leisure. But the wrong kind of growth can be unhealthy and destructive and patterns of growth healthy at one stage of development can become distorted, even self-destructive. Thus, the very same growth processes that have produced so much wealth and power for the industrialized societies are also producing environmental degradation and significant risks of contamination of the earth's soil, water, air and the food chain. Accompanied by persistent inflation, unemployment, social conflicts, economic disparities and potential shortages of energy, food and other key resources, there is mounting evidence that something is wrong.

Surely, we must now realize that these symptoms point to a fundamental malaise within the body of our society. The present growth patterns of industrialized societies are based on consumption beyond our needs, on wastage of resources, on rapid obsolescence, on

fostering over-indulgence on the part of those with the capacity to buy and neglecting the needs of those who cannot afford to buy.

This kind of growth is not compatible with the Conserving Society. Neither is it sustainable. A society that lives by running down and wasting the basic resources that constitute its capital cannot be viable in the long run. The Conserving Society is one that makes wise, restrained use of resources, avoids waste, and limits those activities that impose unacceptable environmental and social costs or create the risk of significant damage to the biosphere.

It must be an exciting society, a challenging society, a dynamic society. To accomplish this, growth is imperative — "new growth". The "new growth" approach must be based on the realization that the most important kind of growth is that which produces the maximum opportunities for self-expression and fulfillment on the part of individual people.

There are limits to growth in the purely physical sense: in order for all of the present population of the world to reach a standard of living equivalent to that of the United States in 1970, it would require the extraction of some 75 times as much copper, 200 times as much lead, and increases of similar orders of magnitude in the production of many other basic resources. As for energy, such a standard of living would require the equivalent of seven times as much oil, eight times as much gas and nine times as much coal as are now produced annually.

But the limits we are beginning to confront today are not primarily physical. They are limits of political and social will and of adequate institutional means to assure careful use of the earth's resources and equitable distribution of benefits and costs resulting from their use.

These limits do not require us to abandon growth. But they demand that we change our ways and adapt to a more mature kind of growth that is less materially oriented and less demanding of resources and the environment.

The transition of "new growth" in a Conserving Society will only be feasible if it is undergirded by basic changes in

In early August, Mr Maurice F. Strong, Chairman of IDRC's Board of Governors, addressed participants at the 48th Annual Couchiching Conference. Sponsored by the Canadian Institute on Public Affairs, the conference brought together some 200 delegates from the private and public sectors to consider the concepts of Growth in a Conserving Society. The following article is excerpted from Mr Strong's address to the conference, "Spaceship Earth: a global overview," and presents in summary some of the issues he raised.

the attitudes, values and expectations of people. This will mean for industrialized societies a virtual cultural revolution. A Conserving Society will only be possible if the dominant culture is one that places highest values on quality rather than quantity, on conservation rather than waste, on cooperation above competition. By eliminating waste — literally converting waste into wealth — and by careful husbanding of the capital represented by our natural resources, the Conserving Society will be better able to cure the disease of inflation that is gnawing at the vitals of today's indulgent society.

The transition to the "new growth" Conserving Society requires the full participation and active cooperation of the two-thirds of the people who live in the developing world. If the needs of the developing world could be translated into real market demand, it would provide the kind of dramatic stimulus that would start the world's economic wheels turning vigorously again. I would contend that a massive commitment today to the development of developing countries will provide the best means of renewing the economic dynamism of the industrialized countries and creating the New International Economic Order that is so essential to the peace and well-being of both rich and poor.

But in pursuing their growth the developing countries can avoid many of our mistakes; indeed, they can ill afford to repeat them. Already, much of their precious natural capital is being destroyed through soil erosion, deforestation, urban blight and other destructive consequences of imbalanced, ecologically unsound growth practices. They have the opportunity to build the "new growth" principles of the Conserving Society into their own patterns of growth. It will not be easy for them to do this, but in principle they may be better able to make the adjustment than we are.

The period in which we are today is a sort of middle ground in which we know that the old ways are inadequate but continue to cling to them as we have not yet clearly seen the new ways that will lead to a more hopeful future. Change is inevitable; the only question is whether we will be its victims or its beneficiaries. The choice is ours. □

Green and growing energy

Rowan Shirkie

Green plants have been collecting and storing solar energy for about two billion years. Humans have been using this energy in the form of food and, after the discovery of fire, as fuel since time immemorial. Plants transform the sun's energy through photosynthesis, storing it as cell material as they grow. Dry plant matter generally has an energy content roughly equivalent to 60 percent of that of coal, weight for weight. Biomass — all material produced by plants and animals — can be harvested and further converted into a variety of energy forms useful to humans. The most familiar — and through history, the most important — form of biomass energy conversion is by burning, although biomass can provide liquid fuels such as alcohol, gaseous fuels such as methane and hydrogen, and petrochemical substitutes such as oil and various resins.

Estimating the vast potential of the earth's biomass resource is a complex and uncertain task. However, figures that place the energy content of all annual terrestrial and aquatic biomass production at between 15 and 20 times current commercial energy use are widely accepted. This in spite of the fact that even under especially favourable conditions, photosynthesis captures no more than 0.5 to 4 percent of incident solar energy, and a significant portion is lost again during conversion.

Among the areas of greatest biomass production are the humid tropics, although the resource is distributed throughout the world wherever plants grow. These facts, plus the renewable nature of biomass energy, have led energy experts to believe that the biomass resource might be managed to sustain a course of development for rural areas based on self-sufficiency, stability, and increased employment opportunity.

Biomass energy production is both labour intensive and agriculture oriented, and for the overwhelmingly rural population of the developing world, it is a highly desirable fuel. Biomass fuels are, in addition, generally free. Using agricultural residues and animal wastes for fuel fits in well with the other activities of farmers, providing multiple uses for crops and livestock.

End use energy needs in these areas match suitably with the type and quality of biomass energy sources. Fifty percent or more of the energy used by rural peoples in the tropics is for cooking (in the form of low temperature heat); a much smaller percentage is used for lighting, cultural and educational needs. About 25-33 percent is used for pumping water and powering agricultural or village industry.

Trees comprise an estimated 98 percent of all living terrestrial plant matter, and it is direct combustion of wood (and charcoal) that provides nearly 85 percent of the energy consumed in rural areas of developing countries. Yet the importance of the forest energy resource is not maintained by vigorous management programs, with the result that forested areas, especially those near settlements where consumer demand is greatest, are literally being stripped bare. The fuel-wood shortage has been called "the other energy crisis".

Growing trees as an "energy crop", and managing them specifically for that purpose is becoming a priority area of energy research. The ideal fuel tree is one that has a high annual yield when densely planted, resprouts from cut stumps (coppices), prospers in short rotation systems (providing a harvest after only 2 to 6 years), and is hardy and disease resistant. Eucalyptus is a preferred species for such intensive energy farming. IDRC is supporting projects in Egypt, Malawi, and the Philippines to develop and improve new species of fuel and extended use trees, among them *leucaena*, *prosopis*, *acacia*, and *eucalyptus*.

Trees may provide the greatest amount of terrestrial biomass, but other non-woody plants are significant energy resources as well. The distillation of alcohol fuels (ethanol and methanol) from starch plants such as cassava and sugarcane is a fairly well established commercial technology. Alcohol fuel programs are already relatively advanced in some countries, most notably Brazil, which has already begun to blend gasoline and alcohol in a 80-20 percent mix for transportation and industrial use.

Almost any material from biological sources can be digested by anaerobic microbial processes to yield methane and carbon dioxide. Conversion into this gaseous fuel, also known as biogas, is held to be the most economical and practical technology for producing high quality fuel from plant biomass.

An IDRC project team, lead by senior advisor to the president, John Bene, recently undertook a state-of-the-art review of biomass technologies and options for developing countries. The team noted that although the technology of growing, harvesting, and converting biomass for energy production is yet in its infancy, prospects are good that systematic research could quickly bring the benefits of increased energy availability and efficient use to developing areas. They point out that the majority of rural poor cannot afford to buy a conventional energy such as electricity, even if it were made available to them. Without the development of alternative sources of energy such as biomass, the team concluded, the high price of being poor will only continue to climb. □



Trees, towering up to the light, capture energy from the sun. The conversion of this biomass might provide rural peoples with a sustainable alternative to conventional fuels.

Photo: Jack Redden

Biogas

a solution to many problems

Michelle Hibler

In almost all developing countries, the lack of adequate supplies of cheap, convenient and reliable fuel is a major problem. Rural communities depend largely on kerosene, wood and dung for their cooking and lighting needs. But kerosene is now priced out of reach of many people, and wood, except in heavily forested areas, is in short supply. The search for firewood occupies a large part of the working day and has resulted in widespread deforestation.

Dung is in constant supply wherever there are farm animals and, when dried, it is convenient to store and use. But burning dung destroys its value as fertilizer, thus depriving the soil of a much needed source of humus and nitrogen.

Rural areas of developing countries are also plagued by a lack of adequate sanitation. Improper waste disposal spreads disease, contaminates water sources and provides breeding grounds for disease-carrying insects.

The problems of improving environmental hygiene, conserving resources and finding alternative sources of fuel may seem unrelated. Their solutions, however, are not, as many countries experimenting with biogas technology are discovering. Biogas, a mixture of methane and carbon dioxide, is produced by the fermentation of organic matter. The process of anaerobic fermentation is a natural one, occurring whenever living matter decomposes. By containing the matter — and the process — in a digester or biogas plant, the combustible gas can be trapped and used as fuel for household lighting and cooking. The digested slurry that remains can be used on the land as a soil conditioner and fertilizer.

Biogas plants basically consist of a large chamber constructed partially below ground. The waste material — animal dung, human and plant wastes — is mixed with water and fed down the inlet pipe into the chamber. While undergoing decomposition the waste travels to the outlet pipe. The entire process generally takes from 30 to 50 days, which allows for gas production and destruction of most of the disease-causing organisms. The gas is trapped by an inverted drum placed on the liquid's surface and drawn off as needed.

The amount of gas produced and the rate at which it is given off depends on the moisture content of the feed material and on its type. The higher the nitrogen to carbon content of the wastes, the higher the methane yields (human wastes, for example, are relatively high in nitrogen content as compared to cow dung). It is estimated that the wastes from two animals are sufficient to feed a family-sized plant. Gas is produced at temperatures above 10°C, although ideally the temperature should be kept at between 30° and 40°C.

Biogas plants have attracted much interest in recent years and they are in use in several Asian countries: 36,000 are reported in rural areas of India, 27,000 in Korea and more than 80,000 in China. In most countries the value of the gas has been the prime factor leading to their adoption: 70 percent of India's plants, for instance, were built during the energy and fertilizer crisis of 1975-76 — although their use in that country dates back to 1951. Similarly in Thailand and Korea, biogas is being investigated as an alternative to costly charcoal and to save compost materials from being burned.

In Japan and China, reducing pollution from animal wastes has been an important factor. Privies, hen houses and piggens are built in proximity to the fermentation chamber in China. Examinations of the digested slurry have shown that the total number of parasite eggs was reduced by 93.6 percent, hookworms by 99 percent and no schistosome flukes were found.

The greatest benefits from biogas systems, however, are probably to be derived from the manurial value of the slurry, although it is not widely used outside of India and China. Vegetable farmers near Calcutta found that the digested slurry produced bigger and better tasting peas than did other fertilizers and the weight of root vegetables increased by nearly 300 percent.

If biogas plants present definite advantages for rural areas, a number of problems prevent their widespread adoption. In 1977, the IDRC commissioned a state-of-the-art review to identify these constraints and lay the basis for future research. It was found that reliable designs exist for biogas plants but poor construction and operating practices resulted in many failures. To improve the situation the researchers recommended that "good practice" en-

gineering standards for the design, construction and operation of the plants be established and more information disseminated. Because little attention has been paid to burner and appliance efficiency, these components of the systems were generally found to be inadequate.

Current designs, say the researchers, also appear to be more expensive than they need be, putting plants out of the reach of many rural people. In fact, the biogas plant may cost more to build than the family house. A survey carried out by the Indian Institute of Management, for example, revealed that only 26 percent of biogas plant owners in the Gujarat region of India belonged to the low income group. The Indian government has therefore found it necessary to continue to provide grants and encourage loans.

Economic and social constraints to biogas adoption range from a lack of resources — capital, land, time, water — to run the plants efficiently, to the spatial arrangements of communities that make carrying the slurry to the fields difficult. In some areas, psychological and religious barriers exist: in Indonesia, the use of pig manure is unacceptable to the Muslims; in some parts of India there is strong resistance to the use of nightsoil and the gas thus produced.

While biogas systems could provide fuel and fertilizer, recycle wastes, control pollution and improve sanitary conditions, it is not clear how significant these contributions are or will be, say the researchers. The main objectives of biogas investment should be to improve the distribution of income by serving the needs of a wide range of social groups. Large community plants are more likely to achieve this but their operation is plagued by many social and technical problems.

The report concludes that the economies of biogas systems, like their effectiveness, depend on the particular environment in which they operate. For many rural regions of developing countries, however, biogas may provide a viable solution to meeting their energy and fertilizer needs. □

The IDRC has recently published two books dealing with biogas technology: Biogas technology in the Third World: a multidisciplinary review by Andrew Barnett, Leo Pyle, and S.K. Subramanian describes the technical aspects of biomass and organic waste fermentation, its social implications, and economic considerations; Compost, fertilizer, and biogas production from human and farm wastes in the People's Republic of China, edited by Michael G. McGarry and Jill Stainforth discusses methods of waste disposal and evaluates the results.

Adapting forage to changing needs

Neil Thomas

The Comarca Lagunera in Northern Mexico is not much bigger than the Island of Montreal yet it is the country's principal centre of milk production. Some 90,000 cows produce more than one million litres of milk daily, a large part of which is shipped by road as far south as Mexico City and Acapulco.

La Laguna, as the region is also called, is the extremely arid remains of a prehistoric lake. In spite of the region's very high summer temperatures, cool winters, and very little precipitation (slightly more than 200 mm annually), it is an area of intensive forage production. This production, combined with two other major crops, cotton and grapes, results in a prosperity almost unique in Mexico. The traditional forages grown in the region are alfalfa, corn, and sorghum in the summer, and oats in the winter.

Water shortages are becoming noticeably more critical each year, however, and the production of forage is insufficient to meet the needs of an ever-increasing cow population. To these problems are added a generally poor knowledge of the principles of feeding for milk production and traditional systems of forage production that are extremely costly in relation to their efficiency of production and utilization. CIAN, the Centro de Investigaciones Agrícolas del Norte, a regional centre of the Instituto Nacional de Investigaciones Agrícolas, located just outside the city of Torreón, is expanding its forage research activities in an effort to solve the problems of the milk producers.

The first step has been to form a team of young scientists who have, or will acquire, the diversity of skills required to carry out research in the complex area of forage/animal production systems. The team currently numbers seven, and possesses research background in forage production systems, forage quality evaluation, animal management, economics, and extension.

An extremely serious problem in the region is the shortage of water. Annual evaporation is more than five times as high as precipitation, and the unpredictability of the rains means that they are ignored in the development of irrigation schedules. As nearly all the water used in forage production is from sub-soil sources, this also means that the water table is falling alarmingly.

A large part of the research effort has therefore been concerned with increasing the efficiency of use of this water in the production of forage. One approach has been to shift the focus of the annual production cycle from summer to winter-growing species. Alfalfa receives an estimated 2 to 3 metres of water annually over its 3 to 4 year life span. A quarter of this is applied during the winter when the crop is dormant, and the remainder during summer when potential evapotranspiration rates are extremely high. Like the corn and sorghum (which are generally ensiled), a part of the alfalfa crop is conserved for use as hay during the winter. This represents an extremely expensive use of water because high losses of nutrients occur as a result of mechanical or biological inefficiency, and because winter growing conditions are such that winter forage needs can largely be met by production during the same period.

Considerable success has been achieved with the introduction of a winter-growing annual, Italian ryegrass (*Lolium multiflorum*). Its potential yield reaches three-quarters that of alfalfa, but it requires only a quarter to a third of the water. This species has the added advantage that it leaves the land and the water free for summer-growing annuals that are more efficient in their water use than alfalfa. The net result is a forage production sequence that provides more feed at a lower water cost per unit of forage produced.

Crop water needs and the quantity applied in irrigation are not the same, however. The gravity irrigation technique used in the region makes it difficult to apply water at a depth of 10 cm or less (sufficient to recharge the water storage capacity of the root zone of most forage species). To be efficient, this method requires perfect land preparation and the correct relationship between the volume of water available per unit of time and the length of the unit to be irrigated. Poor land preparation is common amongst small landholders, especially those using animal power, and the consequent poor water management is reflected in the lower crop



Autumn sowing of Italian ryegrass in Northern Mexico. Because of its high productivity and low water requirements this species has become the most important winter forage in the region.



Photo: A. Dorozynski

Forage research has traditionally focused on the animal. A better understanding of how forage and animals interact could lead to increased milk production.

yields found in this sector. With the gramineous (grass family) species the lower yields are a result of the loss of nitrogenous fertilizer, mainly through leaching.

The technical problems facing the research group are many. At the regional level, poor knowledge of feeding standards for milk production has meant that much information is requested by the farmers that is not available to the research worker. Most farmers will answer "protein" when asked what is the most important single constituent of a forage intended for a milk animal. The revelation that Italian ryegrass will maintain or boost milk production in comparison with alfalfa — although it has an appreciably lower crude protein content — has led to some radical changes in the concept of a high quality forage. The importance of the energy content of a forage is now appreciated and is leading to a modification of the research approach, both in terms of efficiency of water use in forage production, and of efficiency of transformation of forage into milk.

Many social and economic differences also exist in the regional milk production picture. Herd sizes range from 20 to 2000 animals. The *ejidatarios* (members of agricultural cooperatives) generally have small herds, and their forage production systems suffer from many management problems. The *pequeños propietarios* (small landholders) have the larger herds and have invested considerably more in machinery and buildings.

Although both groups may have used the same quantities of physical inputs, the tremendous differences in forage output per hectare between them has indicated the need for a different approach in developing sets of recommendations and management practices tailored to each. This important aspect of research has been overlooked in the past and cannot be investigated in an experimental station.

Traditionally, forage research in Mexico has been focused on the animal, an approach that is understandable given the importance of cattle production in the nation's past and present history. The development of a systems approach to forage/animal production has been held back by an insufficient understanding of the basic resource of the system — the plant itself — and how the quantity and quality of forage can interact with the animal and result in a profitable or nonprofitable enterprise. One of the objectives of the research is to develop within the research group an awareness of the interactive nature of forage and animals, and the ability to quantify these relationships in such a way that the work will be applicable to the activities carried out in cooperation with the milk producers.

Other forage species are being tested under regional conditions, with a view to the fact that water will become scarcer each year. Germplasm of *Lolium* is being sought from the Mediterranean area, where it is also a winter-growing species, in order to find ecotypes adapted to the high fall and spring temperatures, thus extending the winter growing season. Berseem clover, *Trifolium alexandrinum*, is also being considered as a winter crop, as it has performed well in introductory trials. As well as continuing work with corn and sorghum in an attempt to improve the efficiency of the production and ensiling process, work has also begun with forage sunflowers and with millets in an attempt to further decrease summer water use.

With climatic and economic conditions becoming more difficult, the forage production systems supporting the milk production industry in La Laguna are changing. Already, as much as 50 percent of the forage consumed in the region is produced off the farm. To reduce production costs and increase the biological efficiency of their enterprises, the milk producers require forage production systems tailored to their changing conditions. The research group in Torreon is responding to these problems, helping to maintain the prosperity of the regional milk industry. □

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Vietnam fights a different war

Anil Agarwal



Photo: CIDA

When Ho Chi Minh declared Vietnam's independence from the French in 1945, millions of Vietnamese were suffering from malaria, tuberculosis, leprosy, polio, typhoid, and cholera. Trachoma, a virus disease of the eyes which often results in blindness, was widespread, and almost all Vietnamese harboured parasites such as hookworm. French statistics had shown that, in 1938, Vietnam's death rate of 26 per thousand was among the highest in the world. The child mortality rate reached 30 to 40 percent.

Today, the picture has changed dramatically. Over the last three decades, the Vietnamese claim to have almost eradicated malaria in the North; "drastically reduced" polio, typhoid, whooping cough, diphtheria, and cholera; and cut down the infant mortality rate, perhaps the most sensitive index of a society's health, to 3.3 percent, a tenth of what it was before independence. The battle for a disease-free environment has, however, just begun in the South.

How Vietnam has been able to battle with disease is the topic of *Health in the Third World: Studies from Vietnam*, recently published by the Bertrand Russell Peace Foundation of Nottingham, England. Originally written by North Vietnamese authorities, the articles explain how Vietnam was able to meet the medical needs of a country at war. The book also brings out several lessons for other developing countries: the masses were intimately involved in the delivery of health services; the traditional systems of medicine were studied and integrated with modern "Western" medicine; and appropriate technologies were used wherever possible.

In 1945, Vietnam's medical resources were pathetically underdeveloped. There were just 47 hospitals, 9 maternity homes, and 100 fully trained physicians (one for every 180,000 people). Most of this infrastructure was based in the towns, while the people lived mainly in the countryside. Above all, the human environment was so polluted that there was little chance of remaining healthy.

The "fecal peril", as the Vietnamese call it, was particularly intractable. The traditional water supply was the stagnant village pond shared by everyone — from humans to buffaloes. But in the Vietnamese peasant's eyes, water was by nature clean. "All dirt is washed off by water", so a saying went.

Developing an adequate health system in these conditions was obviously an uphill task. A key choice had to be made. Should Vietnam build up a national system of medicine, essentially on its own efforts, or rely primarily on the assistance of more advanced countries? "We have chosen the first path", said Dr Pham Ngoc Thach, North Vietnam's first Minister of Health. "It was a political choice, not a medical one."

Experience has proved Dr Pham right. A Western-style system, for example, would have meant that before a doctor could treat trachoma, he would first have to go through several years in a medical college. The Vietnamese found that after a short course of specific training, many ordinary people could give adequate care to patients suffering from malaria, trachoma, and tuberculosis. Hundreds of thousands of surgical operations for entropion — a complication of trachoma in which the eyelids turn inwards — have been conducted by Vietnamese village health workers after only a few weeks of training.

Furthermore, a Western-style hospital based system would not have destroyed disease at its roots. The old adage "prevention is better than cure" was the obvious answer for Vietnam, and this also meant mass mobilization to control unsanitary practices. The key to their health system, the Vietnamese proudly claim, is the special latrine they developed in the early sixties, after years of painstaking research. It consists of a dry, airtight double septic tank: when one compartment is two-thirds full, it is topped up with earth; the wastes are composted to produce a safe and inoffensive manure while the second tank is in use.

The war that has prevailed in Vietnam since its birth has greatly helped to shape the decentralized structure of its medical system. The war against the Japanese and then the French in the 1940s and 1950s was fought from the depths of the jungle. It helped the Vietnamese to gain respect for existing traditional medical systems, for locally available herbs, and for cheap, simple medical skills that could be acquired in a short time. The heavy bombings by the US Air Force in the 1960s and 1970s forced Vietnam to extend this decentralized, ever-ready medical aid service to involve as many people as possible — and created a heavy demand for surgeons.

The Vietnamese responded by teaching surgery to all medical personnel, including experts in tuberculosis, internal diseases, childcare, and eyesight. As late as 1964, nearly all surgical operations had to be done in provincial capitals. By 1966, 90 percent of the villages in the country had set up their own health centres, where operations were performed in underground operating rooms or in thatched huts with a parachute as a roof.

These 30 years of incessant war also led to a decentralized system of producing medicines. Medical schools, villages, and private individuals alike were urged to grow their own herbs. The study of local remedies has produced a large number of herbal treatments for neuralgia, diarrhea, rheumatism, dysentery, and internal parasites such as hookworms. Dr Pham points out that the Vietnamese are greatly concerned that

with increased felling of forests and consequent reafforestation, many wild species of herbs may disappear. The study of the curative properties of Vietnam's plants, their selection and cultivation, are now a priority.

The most remarkable success seems to have been in the prevention and treatment of tuberculosis. The Vietnamese found that the live BCG vaccine used to prevent tuberculosis was very difficult to use on a mass scale since it needs refrigeration. By 1955, the World Health Organization (WHO) had abandoned the attempt to produce a vaccine with dead BCG, even though a dead vaccine does not need to be kept cool. The Vietnamese persisted with their research. Finally, in 1960, they found that if the BCG vaccine was kept at 43°C for one month, it gave the same immunity as live BCG — and no longer needed refrigeration. By 1971, some 20 million vaccinations with dead BCG had been done in Vietnam, with extremely good results.

But what about people who already have the disease? The standard treatment combines three drugs: INH, PAS, and streptomycin. In Vietnam, this proved effective but costly, and special care was needed as streptomycin can cause deafness. So the Vietnamese tried leaving out streptomycin and PAS, and combining INH with injections of placenta extracts — a treatment that had been used successfully against a variety of infections in the days of the underground resistance against the French. But this did not work against TB, until, one day, a practitioner of traditional medicine suggested that the injections of placenta extracts be given at the point where the acupuncture needles are inserted to treat the lungs. The method proved so effective and easy to handle by village health workers that it has been used to treat tens of thousands of TB cases.

Marked by its efforts to mobilize every possible resource and to harness the self-help capability of the people, Vietnam's medical system is organized virtually on a war footing, which may be the prime reason for its success. In the developing countries of Asia, Africa, and Latin America, where 200 million people are affected by schistosomiasis, 200 million by malaria, 500 million by trachoma, 300 million by filariasis, 20 million by leprosy, and another 50 million by tuberculosis, this is probably just the way health services need to be organized — as if the entire Third World was fighting a war. □

Anil Agarwal is assistant editor of *Earthscan*, a media information unit on global environment issues supported by the UN Environment Programme and operated by the International Institute for Environment and Development. This article is adapted, with permission, from *Earthscan* features.

“Bangladesh agriculture needs a new strategy”

Noazesh Ahmed

After completing his undergraduate studies at the University of Dacca, Dr Noazesh Ahmed received his Ph.D. in Agronomy and Botany from the University of Wisconsin, U.S.A. He has served as Chief of Evaluation, Bangladesh Agricultural Development Corporation, and Secretary of the Tea Board. Presently he is associated with a group of consultants specializing in agricultural development, flood control and irrigation. Dr Ahmed's recent book, Development Agriculture of Bangladesh, has earned him the Presidential Gold Medal for 1978. He is a member of the Bangladesh Association for the Advancement of Science.



New technologies have not succeeded in bridging the gap between yields at the experimental station and those obtained by the farmers. Massive crop improvement programs carried out by national institutions should be a first priority in Bangladesh.

A recent study made by the Asian Development Bank contains the following conclusions: For the Asian region as a whole (Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Burma, Indonesia, West Malaysia, Philippines, Thailand, Taiwan, and South Korea) food production growth has barely kept pace with population expansion, and in the case of some countries, per capita cereal production actually fell over the past decade despite new food grain technology. In the majority of these countries most people are eating at a nutritional level below that required for normal health.

By 1985 the region could have a deficit of rice, wheat, and maize ranging from 24 to 30 million metric tons. Even with optimistic assumptions about future conditions, the deficit could still be as much as 15 million tons. Projections of unemployment by 1985 for Bangladesh, Indonesia, Sri Lanka, India, and Nepal range from 10 to 20 percent. The Asian Development Bank study concludes that the region as a whole appears to be no nearer solving the food problems than it was a decade ago. A major problem that has to be recognized is that direct transference of a newly developed crop variety from the very specific environment of international crop research centres to the widely ranging environments found at the farm level may reduce potential yields considerably and render innovation unprofitable.

After 10 years of the so-called Green Revolution, Bangladesh agriculture — like that of many countries in Asia — has failed to show any appreciable progress in eliminating poverty and revitalizing economic life in the country. Food production growth has barely kept pace with population growth, and per capita rice production actually fell in Bangladesh during the past decade. Substantial year to year fluctuations in agricultural production, due mainly to weather, have aggravated the situation. No dependable technology has yet been developed by the international and national organizations.

Bangladesh unfortunately relied heavily on “imported” technology since the mid-sixties for agricultural and rural development. Emphasis was laid on foreign developed “miracle” seeds and management of their high-input requirements of fertilizer, water, and plant protection chemicals. It is true that some available high yielding varieties (HYVs) of rice (IR-8, and IR-20 for example) can give fantastic yields; but this is true only when they are grown under optimum conditions. To create such optimum or

ideal growth conditions for these varieties under the average farm conditions of Bangladesh would be very difficult. At the end of 10 years what have we gained at the national and farm level? We have only increased the cost of production by increasing the level of fertilizer, plant protection chemicals, and irrigation requirements. National yield and production levels have remained almost static for the last 10 years.

It becomes quite obvious that the agricultural strategy of Bangladesh, like that of other rice growing countries of Asia, is in serious trouble. It is also clear that in addition to those socioeconomic and institutional constraints such as tenancy, farm size, extension, credit, and so on, the applied technology is itself in trouble. One should bear in mind, however, that the scientists are not wrong...in theory. The genetic creation of IR-8 or IR-20 are master works like the creation of hybrid corn, HYV Mexican wheat and hybrid cabbage. It is the diversity of agroecological conditions and socioeconomic constraints of the rice growing regions that are not congenial for wide and successful adoption of those HYV rice varieties of IRRI (International Rice Research Institute) origin. If the same genetic principles are applied to develop rice varieties for existing agroecological and socioeconomic conditions at the farm level, we may come up with high yielding varieties having low requirements for fertilizer, water, and pest control, or adapted to a wide range of temperature, humidity, and monsoon conditions.

Bangladesh agriculture needs a new strategy: one that is based on the use of appropriate technology, with the objectives of increasing yield per acre through labour intensive cultural practices, and reducing costly imported inputs. While it is essential that appropriate technology must be developed immediately, it should be kept in mind that technology alone cannot solve all problems, it can only alleviate them.

Appropriate technologies will be those suitable for adoption on small farms, and those which tend to enhance use of available local resources and less costly inputs of fertilizer, water, and plant protection chemicals. In addition, such innovations must function with relatively unsophisticated support systems, be cheap and effective, demonstrably superior to traditional methods, and must have an immediate impact. Nevertheless, improved genetic material (seed) will still play the key role in these technologies.

The first priority then, is for a massive development program of the major crops in Bangladesh. Breeding and other adaptive work at the Bangladesh Rice Research Institute (BRRI) and a few other national organizations has shown very promising results within a short period of time. There is a clear indication that local scientists can do an excellent job with some international cooperation.

Such a program should be initiated immediately, and it should be done on a national emergency basis. Agricultural productivity and rural prosperity will heavily rely on well-adapted high yielding crop varieties that will, in turn, influence the nature of technology to be adopted.

Though the country is small in size it has a wide range of agroecological variations. Intensive study on the subject is necessary as it is an integral part and initial step in adaptive work at the farm level, and present information on agroecological variations is scanty.

Each major agroecological zone should have a full-fledged research station with a large number of centres in micro-zones. This, of course, would require a large number of trained personnel and huge capital outlays. The country already has a fairly large number of trained persons who can be attracted to the project.

How much capital is being spent on agricultural research at present? Not even 0.1 percent of the GNP, or 0.16 percent of the agricultural contribution to national income. If capital is short, this could be made available by reducing the cost of other activities or re-allocating the outlays.

One of the great anomalies in Bangladesh agriculture is that agricultural education (under the Ministry of Education) and research (under the Ministry of Agriculture) are far apart. Education, research, and extension must be brought under one roof, as is the case in countries as diverse as Holland and India, if appropriate technologies in agriculture are to be developed. One solution would be the establishment of a rural university system that could create the right atmosphere for generating appropriate technologies in agricultural and rural development and for the development of a competent corps of agricultural scientists, educators, and extension specialists.

Viewing Bangladesh's present condition, a rural development program should have two essential objectives: to increase the productivity of the rural poor, and to ensure their full participation in planning and executing the program. Identification of target groups of beneficiaries and careful selection of areas for project location are very important.

Though accelerated agricultural productivity can open new employment opportunities, new off-farm jobs must also be created on a scale hitherto not considered. A key component of a rural employment strategy should be rural works, which represent a large, but as yet largely untapped source of potential employment. The second key element would be small scale rural industrialization. As with the crop development program, genuine commitment to a rural work strategy would require drastic shifts in development priorities and in sectoral resource flows, and it should be ex-

cuted simultaneously on a national emergency basis.

Irrigation is as important as fertilizer in increasing production, particularly in the case of rice, wheat, potatoes, winter vegetables, and sugarcane. However, water use efficiency and management practices are very poor in Bangladesh. Emphasis should therefore be laid on increasing efficiency in water use, and on improving operational practices so that more areas can be brought under irrigation with available resources.

Efforts must also be made to determine the most cost efficient approaches to expand low cost irrigation systems, such as low lift power pumps, shallow tubewells, etc. In the construction of a large scale irrigation system, caution must be taken in planning and design, and careful studies are needed to establish the critical interactions between engineering, agronomic, economic, institutional, and social performance before appropriate choices can be made from among the various possible approaches to irrigation systems.

The introduction of modern technology in agriculture, with its relatively high requirement for purchased inputs, has increased the need for agricultural credit. The present practices of credit programs tend not to take into account the interest of small farmers, but are designed instead to satisfy the short term goal of securing more food. In terms of the requirements of credit for small farmers, the desirable characteristics of a lending institution are that it should be readily accessible and flexible in meeting the timing of a loan, it should be prepared to defer repayment due to crop failure or other unforeseen calamities, and it should be prepared to deal with a large number of small borrowers in both lending and repayment operations.

Viewing the socioeconomic structure of the country, land reform as a component of institutional change assumes special significance. Yet, if the other components of the agrarian system are not properly aligned with development objectives, not much should be expected from land reform alone. For Bangladesh agriculture, land reform could encourage a more balanced social ordering in rural areas, so that the promise and opportunity for economic mobility becomes more real.

Bangladesh can no longer afford to constrain the productive potential of the agroeconomic systems. The rate of growth of agricultural output must be accelerated considerably. This has to be done in the way which allows the small and marginal farmers to both contribute to, and benefit from, the growth. □

BRIEFS

USING MOTHS AGAINST MOTHS

The warehouse moth is a serious threat to stored grain in the tropics. The Kenya Maize Board, like many others, controls the moths by fumigating bagged maize with methyl bromide — a nonspecific insecticide — under gasproof sheets. In 3 to 4 months, however, the pest moths reappear and it is necessary to refumigate.

Investigations carried out in Kenya and England by Britain's Tropical Products Institute (TPI) showed that while fumigation killed the moths, many more were still flying about the warehouse at the time of fumigation. Worse yet, a mite that preys on the eggs of the moth was killed. The moths returned to enjoy a parasite-free environment and reinfestation was rapid.

TPI researchers studying the mating of the tropical warehouse moth experimented with the use of sex pheromones — scents given off by the insects at mating time — to inhibit mating in the adults. They found that if small quantities of artificial pheromones were released in the warehouse, the male moths became confused and the frequency of mating reduced. The predator mites were unaffected by this treatment.

The experiments are by no means complete, but the researchers believe that by examining the ecology of the storage environment, it is likely that natural control measures involving predators and insect behaviour may be identified to complement the use of conventional insecticides, thereby increasing their efficiency.

FROM CHINA: NEW GOITER THERAPY

In 1970, Grandma Liu Teh-shan came to the Chinese People's Liberation Army Unit Hospital, in Liaoning, asking for a goiter operation. Because of her advanced age and poor health, the staff had to refuse her request. "Couldn't you think of a method to cure me without an operation?" she asked.

Goiter problems are usually treated by oral administration of iodine — a long and costly method of treatment that is ineffective in larger or nodular goiters — or by surgery, which requires equipment and facilities and is inconvenient

for large scale treatment programs in areas where goiter is endemic.

Basing themselves on a mode of treatment devised by a barefoot doctor, which consisted in administering iodine orally while painting the affected goiter with an iodine solution, and on acupuncture that had proved to be successful in some cases, a team of researchers from the Liberation Hospital and the Pienling Regional Hospital in Penhsi County tried a new approach: injecting iodine tincture directly into the swollen gland.

Since September 1970, they have used this form of therapy in all cases: the success rate has been 95.9 percent, reports the *Chinese Medical Journal* in its January 1978 issue. Follow-up investigations have also shown that the local injection does not impair thyroid function.

Basically, alcohol, distilled water and benzyl alcohol are mixed with two percent iodine tincture and the mixture is sterilized. The method of injection and the number required depend on the type of goiter and the severity of the condition. Follow-up treatment consists of oral administration of willow leaf tablets (1 kg of willow leaves contains 10 mg of iodine), adding a willow leaf infusion to the village well, or supplying the patient's diet with iodized salt or bean sauce — all prophylactic measures that a number of communes had already begun. The relapse rate was less than one percent.

THE LATEST STRAW

If a building firm in the south of England has its way, the children's story of the wolf and the three little pigs will have to be rewritten. The firm has developed a technique for using ordinary straw as a successful building material. Using their method, the straw is heated and compressed into panels which are then fitted onto an ordinary timber frame. The result is a windproof, absolutely solid construction.

The straw won't burn either. Researchers held a blowtorch to one of the straw panels for 2 minutes and barely managed to singe it. There are other advantages, too. For one thing, straw is plentiful and cheap — a prototype house cost us\$6000 less than if conventional materials had been used. Straw is also a natural insulator. Finally, the panels are light and much easier to build with than bricks and mortar.

HULSE IUFS'T'S NEW PRESIDENT

Joseph H. Hulse, Director of IDRC's Agriculture, Food and Nutrition Sciences Division, has been elected President of the International Union of Food Science and Technology (IUFS'T). He was installed for a four-year term at the Union's International Congress held in Kyoto, Japan, in September.

Founded in 1970 during the Third International Congress of Food Science and Technology, IUFS'T is a voluntary organization of scientists from some 37 countries. It is dedicated to the expansion, improvement, distribution and conservation of the world's food supply through such activities as the exchange of scientific and technical information, support for advances in food science and technology and stimulating education and training in related fields.

Mr Hulse is a founder member of IUFS'T and chairs the Union's Committee on the Needs of Developing Countries. The author of several books and numerous articles on food science and technology, Mr Hulse is a member of a number of national and international bodies concerned with the improvement of the world food situation.

A DIFFERENT BRAIN DRAIN

An interpretation of the new statistics published by UNESCO (*UNESCO Statistical Yearbook 1976*), has led the prestigious British science magazine *New Scientist* to conclude that much of higher education in the Third World is "impractical and irrelevant".

Although doctors may be overrated as providers of medical care, they are still more needed than lawyers in developing countries, the magazine suggests. But it notes that law students outnumbered medical students in many countries: six to five in Algeria, three to two in Senegal, and three to one in Ivory Coast. A comparison was made with Canada, a healthy developed country, where there were nearly three times as many students of medicine as of law. Law seems preferred in developing countries because of the possibilities for higher status and political power it is thought to offer.

New Scientist points out that if developing countries are to end scientific and technological dependence on the West — an issue often raised by Third World coun-

tries — they must train far more indigenous scientists and technologists. Yet the UNESCO statistics show social science students greatly outnumbering those in natural sciences; tenfold and greater in a number of cases cited. Pakistan, Algeria, and Ivory Coast were exceptions in which enrolments in the natural sciences were higher.

Perhaps most significant were the statistics on agricultural training, and as the magazine points out: "In all but a handful of Third World Nations, the development of agriculture has to be the foundation of urban and industrial development. Yet almost everywhere the number of agriculture students was small or insignificant. In the Philippines, there were only 3911 people studying agriculture against 8285 studying art, Brazil had 17,490 agriculture students and 24,421 art students."

HIGH COMMISSIONER TO CANADA

Ernest Corea, Director of IDRC's Publications Division since September 1977, left the Centre in June 1978 to accept the appointment of Sri Lanka High Commissioner in Canada.

A Sri Lankan with an extensive background in international journalism, Mr Corea is a graduate of the University of Ceylon. He was editor of Sri Lanka's principal English newspapers, the *Ceylon Daily News* and the *Ceylon Observer*, and later, features editor and foreign affairs specialist of the Straits Times Group in Singapore. He also served with the United Nations in Washington and in Leopoldville (now Kinshasha, Zaire).

DRUGS HIT THE TARGET

Leishmaniasis, a parasitic disease spread by sandflies, is widespread in the Middle and Far East. Symptoms of the disease include anaemia and enlargement of the liver and spleen. Treatment is by compounds of antimony, but the parasites lodge in the liver and the drugs are cleared out by the liver's phagocytic cells before they can take effect.

Better treatment for leishmaniasis may now be close at hand. Researchers at the Medical Research Council's Clinical Research Centre, near London, England, have pioneered a method of treatment using liposomes. These are tiny packets of drugs, coated

with a phospholipid and treated so they will release their contents only when they reach a certain organ. Experiments at the University and School of Tropical Medicine in Liverpool show that targeting drugs in this way can be extremely accurate.

In experiments on rats, the Liverpool team used liposomes containing antimonial drugs. The phagocytes in the liver break down liposome coatings too, but that means the drugs are released just where they are needed. Liposomes also appear to improve the uptake of drugs by the cells. In fact, one of the drugs used entails doses near to toxic level, administered over a long time. Injected in rats in near lethal amounts, they had no effect on the infection. A single dose of less than half that level completely cleared the infection when carried by liposomes.

The investigators say that targeting presently used drugs in this way may be feasible against a whole range of manifestations of the disease.

FUNGUS FREES FERTILIZER

A fungus growth, widespread in trees, shrubs, and other plants, may provide an alternative to costly phosphate fertilizers in the tropics. The growth, formed by symbiosis of plant roots and fungus, is called a mycorrhiza. Under the right conditions, mycorrhizas can improve the growth of the host plant. They thrive on low levels of phosphorus produced in the soil by slowly dissolving phosphate salts. Some of the phosphorus obtained by the fungus is transferred to the plant, which thereby receives more than it would without them.

According to Dr. Robert Black, a botanist participating in a mycorrhiza research program at the University of the West Indies, the vasicular-arbuscular type (VA) of mycorrhizas (so called because of their tree-like shape and flasks) could play an important role in tropical agriculture. It has been discovered, for instance, that when mycorrhizas are added to a combination of bacteria and rock phosphate (rock phosphate is too insoluble to use as fertilizer but is dissolved by bacteria), a plant's response to the fertilizer is considerably improved.

It may be worthwhile to add mycorrhizas to low-phosphorus soils where they are not present, and Dr. Black expects to see the fungus employed as a means of using the slowly dissolving soil reserves. One of the problems that will need to be overcome before the fungus is widely adopted is the development of a means of culture. Presently the fungus will only grow together with a suitable host plant.

Viewpoint

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada, K1G 3H9.

I read with interest your article "Sri Lanka the living laboratory" (*Reports* Vol. 7 No. 2). Since I am myself a farmer, I am delighted to read such articles that enrich my knowledge of scientific farming methods for better yields.

We are also grateful to your organization for being an active member of the donors supporting the major cropping systems project currently underway at Maha Illuppallama agricultural research station.

*D.D.E. Nanayakkara
Polgahawela
Sri Lanka*

While the "Dossier" feature of your latest issue (*Reports* Vol. 7 No. 2) was titled "Media and Messages", one could not help being struck by another message: the need for appropriate technology. Article after article dealt with this topic, from the opening item on the "rediscovery" of traditional medicine, to the final commentary on the need for new water technology.

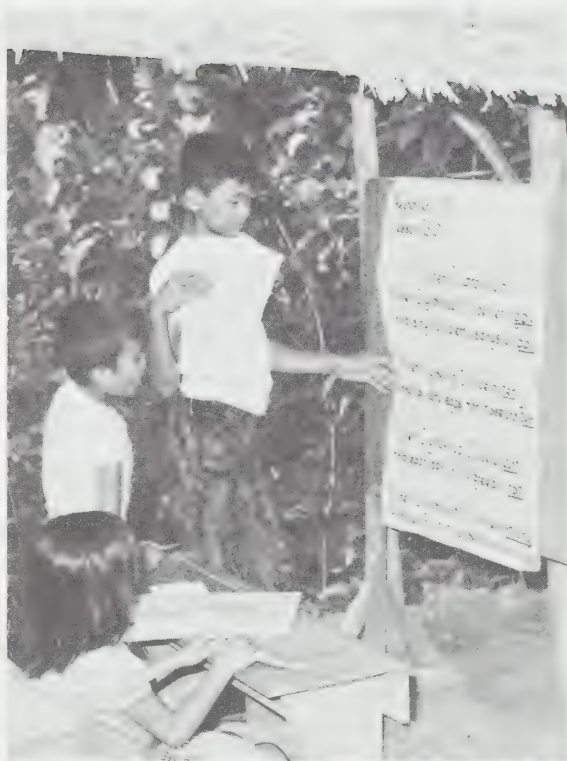
All this made it even more remarkable to read on p. 15 that the WHO regards satellite communications as a priority in its "appropriate technology for health" programme. This is the same organization that has only recently recognized the potential benefits of traditional forms of medicine. Satellites are terribly expensive to build, launch and maintain. The developing countries can "afford" satellite communications only thanks to the largesse of the superpowers, the continuance of which is by no means guaranteed.

In your final article, David Henry points out that in 1975 only \$5 million were spent worldwide on research and development of appropriate technology, a mere pittance compared to the billions spent on space research. It is the priorities that are inappropriate, not just the technology.

*A.K. Opara
Accra, Ghana*

Two films, twice the impact

Bob Stanley



Photos: Clyde Sanger
Neill McKee

The sun is hot, and the children, scattered around the school grounds, have chosen the shady spots — on verandahs, beneath trees, or in little thatch-roofed kiosks their parents have helped build. They all have multi-coloured booklets with them and they are working, individually or in groups.

These scenes come from two new films soon to be released by IDRC, and may come as something of a shock to those who are accustomed to thinking of school in terms of classrooms and orderly rows of desks occupied by students who listen while the teacher talks, and speak only when spoken to. For this is Project Impact, a new experiment in education that has been underway now for some four years at two sites in Indonesia and the Philippines.

Project Impact is being carried out by Innotech, the Regional Centre for Educational Innovation and Technology, which is part of the Southeast Asian Ministers of Education Organization, and is supported by IDRC. It is a "management system for the delivery of mass primary education", an attempt to solve many of the problems with which governments, educators, students and their parents are all too familiar. These problems include overcrowded classrooms, too few teachers, inadequate facilities, and a rigid system that leads inevitably to a high "drop-out" rate if the child's attendance is irregular because of family responsibilities.

In this system, younger children are arranged in small groups and are taught by older pupils who follow a specific program that tells them how to do it. Older students also work in small groups with peers who are at the same learning level. They use learning materials called modules which are booklets structured in small steps with a simple format. They can, to a large extent, teach themselves. If a child misses school, he or she can be fitted into a new peer group or can work with the modules at home to catch up. No longer are teachers tied to a classroom. They move around from group to group assisting in the instruction and learning. One teacher can handle up to 100 pupils and this is the economy of the system. But the success of Project Impact does not lie solely in the area of financial savings. The Impact schools are responding to the problem of irregular attendance, and are doing an effective job of educating the students.

However, the teachers cannot do it alone. They rely on the students of grades 4, 5 and 6 to do programmed teaching. High school students act as tutors, parents and friends do home tutoring, and craftsmen from the community teach their skills to the students

New publications

using the same modular method. The community gets involved in the school.

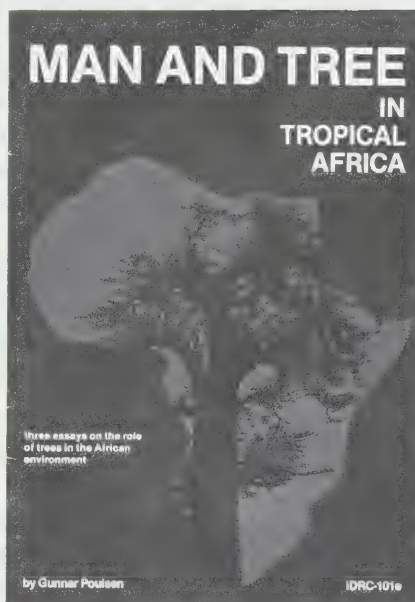
Most of the background to, and details of, this new system are explained in two films due to be released in October, *Project Impact: the overview* and *Project Impact: the system*. Why two films? The first film is designed for people who are involved in making decisions about educational alternatives or for those who are interested in new ideas in education. The second film is more instructional. It is a supplement to the first film for people who want to know more details about the system, possibly for adapting it to their own needs.

The films are a co-production of IDRC and Innotech. Neill McKee, head of the Centre's Audiovisual Unit, filmed and produced them. Don Simpson, an educator who has been involved in the project from the beginning, gave technical direction and wrote the script. The staff of Innotech and the project team members in both the Philippines and Indonesia were also closely involved in the production. They wanted it to focus on the right issues and show the problems they encountered in implementing the system.

The Impact system has been followed closely by other countries in Southeast Asia. Now interest is being shown in other continents. This year the Centre is providing a grant to Jamaica to study the feasibility of adapting the system for use in that country's rural areas. It is hoped that the two films will not only stimulate even more interest in the system, but answer many questions people may have about it.

The films will be available for loan from IDRC offices and Innotech headquarters in Manila. For more information on loan or purchase of prints, write to the Audiovisual Unit, IDRC, Box 8500, Ottawa, Canada K1G 3H9.

The release of Project Impact: the overview and Project Impact: the system will bring to 10 the number of films produced by the IDRC. These include four films on IDRC-supported research: one global, Stretching the Earth, and three regional, Common Task, Continent in the Making and The Search for Solutions, focussing on Latin America and the Caribbean, Africa and Asia respectively. Also available are: Pa-Noi, the Village Midwife, a film on Thai traditional midwives; Rural Health Workers, on the use of paramedical staff in six countries; Thought For Food, documenting an agricultural information system for Latin America and the Caribbean; and, When the Harvest is Over, on the postharvest technology systems in Kenya.



Man and tree in tropical Africa: three essays on the role of trees in the African environment, Gunnar Poulsen. Published in August 1978, 32 pages, IDRC-101e.

In this collection of essays, Gunnar Poulsen, senior research advisor in charge of a cooperative forestry project, explores the relationship between man and tree, and the ecological role of tree species and forest in Africa south of the Sahara. The papers deal with forest production and use of forest products, the fuelwood shortage and its impact on nutrition, particularly in the Sahel, and the effects of shifting cultivation on soil fertility.

Travelers to the tropics, guidelines for physicians, R. Dupuis, J. Keystone, J. Losos, and A. Meltzer. Published in July 1978, 36 pages, IDRC-106e.

Intended for physicians and health workers dealing with travelers to tropical areas, these guidelines discuss how to prepare the traveler, the importance of immunizations, and the diagnosis and treatment of parasitic diseases. The booklet also includes a chart of international immunization requirements, a list of Canadian reference centres for tropical disease, and recommended readings.

Low-cost technology options for sanitation, a state-of-the-art review and annotated bibliography, Witold Rybczynski, Chongrak Polprasert, and Michael McGarry. Published in September 1978, IDRC-102e.

A joint publication of the IDRC and the World Bank, this comprehensive review describes alternative approaches to the collection, treatment, reuse and disposal of human wastes. Designed to describe to the policymaker, the administrator and the engineer the broad range of approaches to human wastes management available today, it emphasizes technological issues but also deals with institutional, behavioural and health-related aspects of excreta disposal.

Projet de réseau d'information et de documentation scientifiques et techniques pour le Sahel, Djiby Sall and Maurice D. Catherinet. Published in September 1978, IDRC-112f.

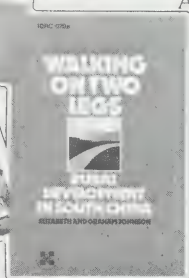
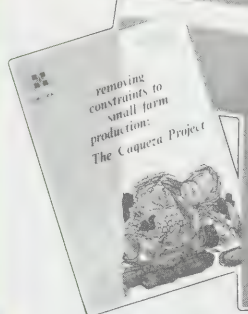
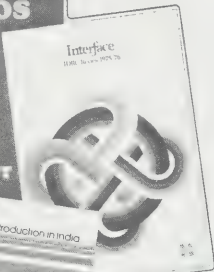
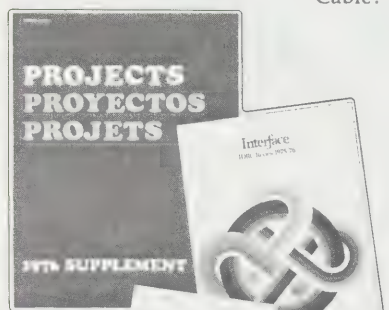
A joint publication of the Inter-State Committee for the Prevention of Drought in the Sahel (CILSS) and IDRC, this report examines the possibility of creating a technical information network in the Sahel. It describes the existing information systems, studies the terms of a documentation strategy, and suggests actions that could be taken immediately. The report's conclusions indicate that it would be possible to use the rich documentation resources of CILSS member states and show how to establish a modern documentation network.

For information on these and other IDRC publications see announcement on the back cover of this issue.

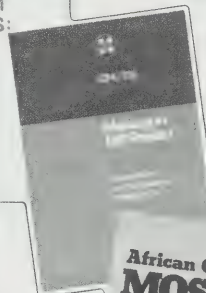
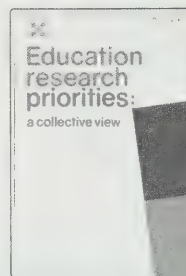
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SCIENCE & TECHNOLOGIE



The IDRC Reports, and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division.

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Contents

3 Harvesting the waters — farming fish for food

Bob Stanley examines the new approaches being taken to exploit aquaculture for food production.

6 On shaky ground

The history of earthquakes in Ethiopia is unique, and so is the man who chronicled them, as Jean-Marc Fleury reports.

8 South helping South

And the result is technical cooperation between developing countries taking a new direction, according to André van Dam.

10 Malaria

Michelle Hibler writes on the new wave of malaria that threatens 260 million people.

11 Dossier: science and technology

As the UN Conference on Science and Technology for Development (UNSTD) approaches, world attention begins to focus on how science and technology can be made to serve development. The nine articles in this dossier outline IDRCs experience in doing just that.

21 Agriculture: a challenge for change

David Spurgeon covered a recent seminar in Edmonton, Canada, on how agriculture is evolving and adapting to meet the demands of a hungry world.

22 Commentary

Yue-man Yeung, Senior Program Officer with the IDRCs Social Sciences Division, visits China after an absence of over 30 years, and finds it greatly changed.

25 Briefs

People, projects, events

26 Viewpoint

Readers' views on IDRC Reports articles

27 New publications and films

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Harvesting the waters

farming fish for food

There is an ancient Chinese saying, widely misquoted, that goes, "If you give a man a fish he will have food for a day, if you teach him to raise fish he will have food for a lifetime."

Raise is the operative word here. Too often the word "catch" is incorrectly used, and that is a crucial difference. For while the rest of the world was concentrating on catching fish, the Chinese were mastering the art of raising fish between three and four thousand years ago.

It was likely in China that men first switched from fish hunting to fish husbandry — "aquahusbandry" the Chinese called it. The practice spread throughout much of Asia, and although new techniques developed naturally over the centuries, it has remained until quite recently very much a small-farm operation. Fish farmers were artisans, not technicians, and aquaculture as it is known today was largely ignored by science.

In this century, the rapid growth in the world's population has resulted in a huge increase in the need for food protein. Fish

is an obvious source to help fill this need, particularly in Asia. The region has experienced the largest increase in population, and has the largest per capita consumption of fish.

Initially, efforts to increase fish production concentrated on marine capture fisheries, and, as was the case with most land-based agriculture, the expansion of fishing areas and improved technology resulted in rapid increases in production during the 1960s and early 1970s. However, it also resulted in a more sophisticated, energy-consuming technology.

Most countries with a fisheries resource to exploit are now developing, or have developed, a deep-water fleet with all the attendant infrastructure of harbours, landing, repair, and processing facilities. Training programs in fisheries gear technology, navigation, and engine operation and repair all have to be established. These are all high capital-cost investments, and with the adoption of the 200-mile economic coastal zone, they should pay dividends.

Bob Stanley

Fish ponds in the Philippines. Interest in fish production is beginning to shift from capture to culture as costs mount and fish stocks dwindle.



Photo: Neill McKee

But the world's oceans are not the inexhaustible resource they were once thought to be. Some experts believe that the maximum sustained yield of the oceans — the point beyond which total fish stocks actually start declining — is now being approached. Certainly it is already evident that catch fisheries are subject to the law of diminishing returns. FAO studies have shown that the cost-per-ton of catching the last two percent of a school of fish is about 10 times that of the first 98 percent. The energy cost of fishing for the last few percent is equally high, and in the future, marine capture fisheries will likely become even more expensive and energy-consuming. As a source of cheap food for the people of the poor nations, the prospects are not good.

By contrast, the potential for increasing fish production through aquaculture is considerable, and much of the technology is relatively simple, inexpensive, and consumes a minimal amount of energy. There are also vast underdeveloped, underutilized areas of water throughout the Third World that are suitable for aquaculture in one form or another. India alone, for example, has an estimated 4 million hectares of village ponds, but less than one-eighth of this area is used for aquaculture.

But if the full potential of aquaculture production is to be realized, there is an urgent need for a great deal more research. Until very recently, the only systematic research devoted to aquaculture has been of the capital-intensive variety aiming for the lucrative luxury markets of the industrialized nations with products such as frozen trout. This might be useful in bringing in foreign exchange, but it did little to benefit the rural poor.

Despite the fact that techniques were developed in Brazil over 40 years ago for the artificial breeding of fish through the use of hormone injections, there still remain many important species that cannot be bred in captivity. It was only in 1977, for example, in an IDRC-supported project in the Philippines, that the milkfish was first bred in captivity. To appreciate the significance of this event, it is necessary to know a little about the milkfish, or *bangus* as it is commonly known in the marketplace.

In the Philippines, Indonesia, and Taiwan, which are the main producers, milkfish is a major source of food protein. With the annual "harvest" running at around 250,000 tonnes, milkfish farming is also of considerable economic importance, especially in rural areas. In the Philippines, for example, it is estimated that some 170,000 families earn at least part of their livelihood from farming milkfish. However, until last year it had proved impossible to breed the milkfish in captivity. Thus all the fingerlings — the young fish required to grow marketable fish — had to be caught in coastal shallows using hand nets. This method is inefficient, as a large number of the tiny fish die during transportation, and is no longer able to meet the growing demands of the industry.



Photo: W.H.L. Allsopp

Increased fish production is hampered by problems of breeding fish in captivity. IDRC-supported projects have developed techniques to induce breeding in some of the species popular in Asia.

Thus when the first female milkfish was spawned in a tank at Pandan aquaculture research station in the Philippines, the event made headlines in the country's newspapers, and earned the researchers involved a special citation from President Marcos.

This success, which has since been repeated in other experiments, was made possible through two IDRC-funded projects in Canada. The first enabled researchers at the University of British Columbia to demonstrate that fertility could be induced through injections of gonadotropic hormones extracted from the pituitaries of the Pacific Salmon. The second enabled them to work through a commercial fish packer to extract and process the gonadotropin from a million salmon pituitaries, and ship it to various IDRC-supported projects around the world.

It was this gonadotropin that was used at Pandan to induce breeding of the milkfish. In Malaysia, where the Centre is cooperating with the Malaysian Agricultural Research and Development Institute (MARDI), the same extract has been used with Chinese carps, which had rarely been bred in captivity. As a result they can now be spawned every month of the year, thus ensuring a reliable and constant supply of fingerlings for the fish farmers.

The common carp was the most popular species for aquaculture in China for many centuries, until, it is said, there came an emperor of the Tang Dynasty whose family name was Lee. Since the Chinese word for common carp sounds exactly the same, the mere idea of eating "lee" became unthinkable — so the fish farmers had to turn to other species to fill their ponds. They did not have to look far



Photo: Neill McKee

Deep-water fishing, although highly capital intensive, should pay bountiful dividends with new technologies and the adoption of the 200-mile economic coastal zone.

to find four other carps: the grass, silver, bighead, and mud carps, all of which happen to have quite different feeding habits, and can therefore coexist productively in the same pond. And so the Chinese developed a highly successful fish polyculture system, quite by chance, more than a thousand years ago.

It was only quite recently, however, that the scientific basis of this system was recognized, and in India researchers at the Central Inland Fisheries Research Institute (CIFRI) were quick to adapt the system to India's needs. Using both local and exotic carps, they developed a polyculture "package" that could produce annual yields of up to 9000 kilos per hectare of pond surface.

With IDRC support, CIFRI initially tested its package in some 40 villages. From the beginning the project went well, as the farmers and villagers quickly showed that they could learn the new techniques and increase production by 10 or even 20 times in a single year. In its next phase, the program will be greatly expanded, but the government of India has already recognized the project's success by singling out two of the CIFRI scientists to receive India's most prestigious scientific awards for their work on polyculture research. Films on the breeding work and the polyculture systems in India have also won two international awards. The development of local polyculture systems has now become an important element of many IDRC-supported aquaculture research projects.

Artificially created lakes and waterways present another opportunity for substantial increases in fish production if only the proper techniques are developed and applied. The urgency of the

need for research in this area is underlined by the fact that the number and size of such artificial bodies of water is increasing rapidly, due to the need for hydroelectric power, irrigation, and domestic water supplies. For example, Africa is estimated to have 40 percent of the entire world's water power, but to date only five percent has been developed.

In Turkey, the Centre is working with the controlling government agency to maximize the fisheries potential of the 125-km-long Keban reservoir, one of the largest of 70 such reservoirs in the country. The project, which began last year, will make a thorough examination of the reservoir's environment, study the relationships between different fish species, test different methods of fish culture such as floating cages, develop a fish disease diagnostic service, and provide training for local staff. A similar project has also begun recently utilizing the canals of Egypt to grow fish in cages, and the techniques developed here and in other related projects may have wide applicability in many areas of the world in future. As the demand for hydroelectricity grows, the number of reservoirs grows with it, presenting many areas with a potential whole new industry.

One type of fish that needs no cage or enclosure of any kind, other than its own shell, is the mollusc — in many ways the ideal animal for aquaculture. The bivalves, such as oysters and mussels, are particularly rich in protein, can be grown suspended from inexpensive rafts or submerged in trays, and have great potential as a source of food protein and income right across the tropical world.

IDRC is supporting a network of projects in Africa, Asia, the Caribbean, and Latin

America that are aimed at improving the oyster's environment and their growth rate. The results have been impressive: in Sierra Leone, the first of the network projects, raft oysters grow to be several times the size of their mangrove-dwelling cousins in 6-9 months. In cooler waters off the east coast of Canada or the USA they might take 3-4 years to reach the same size.

In Singapore, the Centre is supporting a research project to improve the cultivation of mussels. One of the most widely distributed of seafood organisms, mussels are very rich in protein, and have a higher percentage of meat than most other shellfish; even their calcium-rich shells have potential for use in animal feeds. Mussel culture experiments in tropical waters have produced yields as high as 250 kilograms per square metre. Such yields theoretically could produce as much as 100 tonnes of protein from a single hectare of sea surface. One hectare of farmland planted with protein-rich soybean will produce perhaps one tonne of protein.

For all its potential, however, it would be a mistake to assume that aquaculture, no matter how highly developed, can ever solve all the world's food problems. At best, aquaculture production is unlikely to amount to more than a small percentage of the world's total fish production. But it is a very significant percentage. Fish grow fastest in the warm waters of the tropics, and it is here that the need for more food, especially high-protein food, is greatest.

Aquaculture, properly managed, is also an ecologically sound, technologically appropriate means of food production that can provide much needed additional income to peoples as diverse as Caribbean islanders and Sudanese nomads. But much research remains to be done to bring economical aquaculture within reach of the rural poor in developing countries.

To better understand the magnitude of the problem, consider that there are only about 10 farm animals of major economic importance. Yet there are literally thousands of different fish that could possibly be cultured, but about which very little is yet known. Finding out how the best of these thousands of species can be effectively farmed is the challenge of the future for aquaculture researchers as yesterday's art becomes tomorrow's science.



Photo: Frank Green

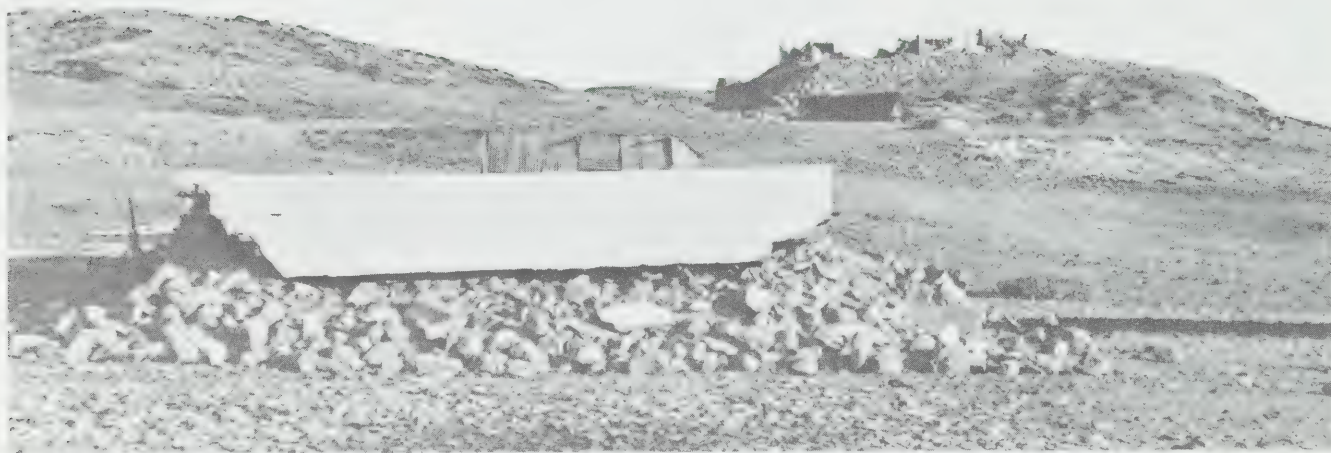
Oysters, a luxury food in many parts of the world, become a practical, low-cost source of protein as new techniques are developed for their culture. Here, oysters are raised on trays in Sabah, Malaysia.

Bob Stanley, Associate Director of IDRC's Communications Division, is author of *Fish farming (IDRC-120e)* an account of the aquaculture research program supported by the Centre.

On shaky ground

the history of earthquakes in Ethiopia

Jean-Marc Fleury



"In the year 87, Zara Yakub was crowned emperor and took the name Constantinos I. That year there was a total eclipse of the sun and the earth shook many times."

Ancient historians, in Ethiopia as elsewhere, were fond of linking the date of birth or coronation of their sovereign to a spectacular natural phenomenon. Modern historians suspect that their ancient colleagues may even have added a few earthquakes and comets here and there in order to give a little more importance to certain special moments in the lives of the great. But no one has cast such suspicions on the chronicler of Zara Yakub's reign. There is no need to invent tremors in a country where the earthquakes on the average of twice a day.

Today the facts recounted by the ancient historian can be found in a new history of Ethiopia — a very special history in that it is a seismic account of the "land of bronzed faces" written by a more specialized successor of the old chronicler. Entitled *Earthquake history of Ethiopia and the Horn of Africa*, the new Ethiopian chronicle is the work of Pierre Gouin, a Jesuit and founder-director of the Geological Observatory in Addis Ababa.

Very few people know more about the history of Ethiopian substrata than Gouin. Born in Montreal, he received a degree in geophysics from Boston University, and taught on the subject and worked as a geophysicist in Ethiopia for almost 30 years. He became the father of Ethiopian

geophysics, so to speak, and was a recipient of the Haile Selassie Prize Trust award in 1969, along with anthropologist Louis Leaky.

In 1976 the University of Addis Ababa published Pierre Gouin's first work, entitled *Seismic zoning in Ethiopia*. This book, produced at the request of the Addis Ababa government, and supported by IDRC, is essentially a seismic map of Ethiopia. It contains the magnitude, and probabilities of earthquakes in 650 locations across the entire country, including 32 towns and villages and 60 existing or planned dam and reservoir sites. Evaluating seismic risk is of particular importance in Ethiopia because of the frequency of tremors and the fact that many communities are located at the edge or at the foot of steep cliffs. Landslides set off by earthquakes could therefore bury entire villages. Such a disaster has already struck the regional capital of Ankober, which was completely destroyed by a landslide in 1842.

Seismicity, as described in *Seismic zoning in Ethiopia*, was determined chiefly through a computer analysis of reams of seismograms recorded between 1900 and 1975. It is in fact only since the turn of the century that modern instrumentation has recorded Ethiopian earthquakes with enough detail to provide accurate data for computer analysis.

Consequently, the forecasts in *Seismic zoning* are based on tectonic activity over the past 75 years, an extremely short period in geological terms. According to Gouin, it was necessary to situate the seismic phenomena of this period within a much larger time frame in order to determine if it was truly representative of Ethiopian seismicity. This meant that data from the "instrumentation" period had to be compared with all information available on the "pre-instrumentation" period. Before the advent of seismographs, the only available data were facts related by historians. Gouin therefore undertook to gather all the information that had been written on Ethiopian seismic activity. He would then be in a position to compare the "instrument seismicity" with the much longer period of "historical seismicity".

"It is fortunate that in Ethiopia, it is possible to consult written documents spanning many centuries, some dating as far back as the 9th century BC", says the geophysicist, who was able to consult some very ancient chronicles.

Gouin brought together all this information in *Earthquake history of Ethiopia and the Horn of Africa*, which will be published by IDRC in 1979. "This second volume", he says, "is, in a manner of speaking, a justification of the probabilities contained in the first book." He acknowledges that he had to break new ground: "My work will, nevertheless, suffice for the needs of the seventies, at

least. But beyond that, if they decide to build nuclear power stations, for example, it will be necessary to make more precise calculations than those contained in *Seismic zoning*. Thanks to the second book, it will be easier to revise my calculations. This seismic history of Ethiopia contains all my personal notes on the subject."

These notes cover the past 575 years of written Ethiopian history: the first geological activity is recorded in a document dating back to the eruption of the Dubbi volcano, on the Red Sea coast, in 1400 AD. The text was written by a historian from neighbouring Yemen, reporting the accounts of sailors who had seen "an immense column of black smoke turn into a great mass of land" and "become a series of hills in a place where, until then, no hills of any sort had ever been seen". This first account of a seismic occurrence was relatively easy to find as the Arabic text had been incorporated into a history of the Yemeni kingdom written by a Briton. However, Pierre Gouin's historical research was to lead him further afield, among other places, to libraries in Rome and the Vatican where numerous Italian works on Ethiopia are kept. He also consulted a great many other sources, including the diary of a French Capuchin monk, Russian seismological bulletins from the beginning of the century, and manuscripts by Ethiopian monks, translations of some of which were conserved in the Bibliotheque Nationale in Paris.

The relative abundance of such documents guaranteed a plentiful harvest of recorded tectonic occurrences, but at the same time raised some difficult problems. The authors often came from totally different cultures — Arab, Egyptian, Italian, French, Russian, and others — so Pierre Gouin was faced with numerous conflicting chronological systems and almost as many spellings of place names as there were sources.

He had to correlate no fewer than 17 different calendars, from the era of the Creation of the World, which began in 5492 BC, to the era of the Incarnation, which began in 8 BC and is currently in effect in Ethiopia, to the Diocletian era, or time of the Martyrs, which began in 284 AD. The situation was further complicated in that although certain chroniclers referred to the same era — that of Diocletian, for example — some assigned to it a year zero, while others did not. In order to make some sense out of all these calendar systems, in which years

Pierre Gouin, measuring the upheaval produced by an earthquake in Ethiopia. On the opposite page, an indication of the destruction . . . a roof lies on shattered walls.



did not always have the same starting point or length, the geophysicist became an astronomer. "Because computers have enabled us to determine with great precision the dates of eclipses from 2000 years before Christ, I was able, by finding references to certain eclipses in each calendar system, to determine to which days in the Gregorian calendar (the present universal calendar) the dates mentioned in the various other systems corresponded", Pierre Gouin explains. This meticulous work even made it possible for him to correct certain errors committed and repeated from author to author down through the ages. At the same time — and this was the end he was striving for — he was able, by reconciling the calendars, to avoid counting the same earthquakes more than once. Ethiopia had quite enough earthquakes of its own without his inventing any!

Another major difficulty stemmed from the fact that most of the country's towns, villages, mountains, and rivers do not yet have official names. There are 80 distinct Ethiopian languages and dialects, and each observer, whether foreign or Ethiopian, had transcribed the local pronunciation of place names in his own way. As a result, there were as many as 15 dif-

ferent variations of the names of certain towns. Once again in order to avoid exaggerating the number of earthquakes, Gouin had to undertake real detective work and consult at length Ethiopian elders and scholars.

The author of *Earthquake history of Ethiopia and the Horn of Africa* accepted all these challenges and produced a work that will no doubt be consulted for a long time to come, regardless of his own modest assessment of its useful life. The book comprises a detailed description of seismic events, with many photographs, maps, and charts. And because the Ethiopian plateau is the only place in the world where there is a surface example of basaltic intrusion — which, according to the theory of continental drift, is how the oceans originated — the book will undoubtedly not only be indispensable to Ethiopia, but will also contribute to the science of geophysics itself.

There is another important facet to Pierre Gouin, the author of geophysical works, that of teacher.

Gouin has contributed to the training of an entire generation of Ethiopian geophysicists who have already begun to serve their country. In addition to participating in theoretical research on the spectacular faults running across Ethiopia, his students have become involved in exploration for copper, iron, and bauxite deposits, leading to the establishment of a number of commercial mines. More recently, the government asked them to devote their efforts to finding underground water sources, supplies that are becoming vital because of drought.

Gouin has travelled all over Ethiopia and says he is struck by the country's immense energy resources, both hydroelectric, on the Blue Nile, and geothermic, in the north. Unfortunately, despite the country's pressing needs, development of such potential is thwarted by the prohibitive cost of transmission lines, and Pierre Gouin concedes that geophysics cannot move these resources closer to population centres. He is nevertheless confident that the Ethiopians will one day reap the benefits of their geophysical wealth.

When asked about future projects, Gouin says he is hesitating between pursuing his career in the Philippines — friends have been asking him for a number of years to come and write that country's seismic history — and working on other books, including a geophysics textbook for African students with examples taken from Africa, and another book on the numerous calendar systems that so greatly complicated his task. □



South helping South

André van Dam

Burma's Central Research Organization invites other nations to assist in the research and development of fibres from indigenous raw materials such as bamboo and reed. Nigeria calls on the Philippines for technical assistance in its inland fisheries development. Mexico assists Ghana in the research and development of quick-maturing, high yielding legumes, corn and rice.

Ecuador provides South Korea and Turkey with information on standards and measurements. Israel assists Brazil in the planning of human settlements in the arid northeast. The (Arab) Gulf Industrial College trains nations from the Middle East in industry and commerce.

These examples of technical cooperation, selected at random, reflect only one angle of a newly emerging trend. There are quite a few angles, as can be seen in the objectives of the recent UN Conference on Technical Cooperation Among Developing Countries (TCDC). The aims of the TCDC were to increase the consciousness in each country of its own experience, assets, and skills in the technical area as it affects development; likewise, to raise awareness of the above resources in other developing countries; to strengthen the institutional ties and arrangements that allow countries to individually and jointly take maximum advantage of such assets; to pinpoint specific opportunities for the developing nations in areas of technical cooperation; and to establish the instruments to arrive at the

most pragmatic and geopolitically feasible cooperation.

Many observers at the conference agreed however, that these objectives — like technical cooperation itself — may only be the tip of the iceberg. In essence, TCDC stands for an effort to restructure the entire development strategy from the perspective of the developing countries themselves. It mirrors the overwhelming priority of the "South" (developing countries) to achieve national and collective self-reliance in an otherwise interdependent world — without cutting any of its valuable ties with the "North" (industrialized countries).

Admittedly, it seems a far more alluring path for Third World nations to follow in gaining access to the technical and intellectual knowledge of North America, Europe, and Japan rather than the more recently acquired experience of other developing countries. However, it must be stressed that in Western Europe, North America, and Japan, capital and — until recently — energy have been fairly inexpensive and abundant, and labour rather expensive. In contrast, capital and energy have always been scarce and costly in the Third World, and labour abundant and (nominally) cheap.

Ours is an interdependent world. It simply is not worthwhile uncoupling one national economy from the world economy. Nor can the Third World afford to opt out of the mainstream of modern technology — as the Peoples' Republic of China did until recently.

China, to mention another focus of TCDC, presently assists 40 other Third World nations with technical knowhow,

mostly of the "small-is-beautiful" type. China wishes to demonstrate the feasibility of projects that require less investment, yet produce quicker yields over shorter production cycles. It does so in different fields of endeavor, ranging from geological prospecting to irrigation, from agriculture to water conservation.

The conference highlighted the enormous diversity of Third World needs and phases of development. It was pointed out that more often than not, technology is economically efficient if the factors of production are mixed approximately in the proportion of their relative availability and cost. The availability and cost of capital, energy, land, labour, and raw materials vary exceedingly among Third World nations, so that each country should select a technology compatible with its factors of production.

That brings us to the heart of the matter: how to successfully marry modern technology (so as to be efficient and also competitive in world markets) with employment (in order to provide jobs for the burgeoning masses of the Third World). Judging by the harsh, cold statistics, technology wins and employment is the loser.

While some conference delegates stressed the financial aspects of technical cooperation, others invoked the overwhelming need for appropriate (or intermediate, or soft) technology. Some urged the South to act as the engine of growth for the world economy, others preferred that technical cooperation be designed to develop the Third World's own most precious assets: its people. For no matter how important blueprints and licensing agreements may be in the transfer of technology, in the final analysis success hinges upon the "carrying capacity" of people.

In the light of the experience of the past

generation, it is desirable to ensure that technical developments do not destroy cultural heritages. On the contrary, technology should where possible be interlinked with mores so as to ensure not only intellectual enrichment, but also the preservation of valuable links with the past and with people's present needs.

For instance, the emphasis on the supply and demand for training facilities mirrors the focus on people present throughout the whole area of technical cooperation. A few examples may suffice to make the point: India provides training facilities in micro-hydroelectrical projects and the establishment of industrial parks. Sudan makes available experts in agriculture and engineering. Malaysia offers training facilities in customs administration and forestry. The Ghana Institute of Journalism trains personnel from other African countries. Colombia's national apprenticeship service provides assistance to neighbouring nations.

If it is clear that technical cooperation should be designed to quicken the pace of development and lighten the burden of the Third World's people, the question can then be raised: technical cooperation — in what?

If I interpret the mood and experience of TCDC correctly, the following five fields of endeavor are singled out most frequently for technical cooperation. They all draw on national experience, which lends itself to horizontal (South-South) transfer:

- in agricultural production (including animal husbandry, fisheries, and forestry), to develop intermediate technology designed to assist small farmers and entrepreneurs;
- in education, to train people in areas that match their skills with the most immediate jobs;
- in public health care, to serve the people's real needs by preventive medicine and the use of local drugs wherever possible;
- in housing and urbanization, to further community self-help by using, for instance, local building materials and de-

centralizing industry away from large cities; and

- in energy generation, to develop local resources such as solar energy, wind power, photovoltaics, geothermal energy, and biomass energy.

There are some striking examples that illustrate the potential of technical cooperation in these fields. The Indian Council of Agricultural Research and the Philippine Council of Agricultural and Resources Research pool their experience in appropriate postharvest technology as well as in the recycling of organic waste for the production of compost and methane gas. Brazil, Indonesia, Malaysia, Mexico, and Nigeria have expressed interest in making similar cooperative arrangements with India.

The Philippines assist Romania with coal technology and foreign trade technology, whereas Romania provides the Philippines with technology for machine tool assembly and petrochemistry. Countries as far apart as Saudi Arabia and Argentina gainfully exchange information on scientific and technical research in agriculture and manufacturing.

Technical cooperation will also prove its worth in sensitive areas such as birth control, where cultural as well as technical obstacles must be overcome. Biological and medical research, as well as educational tools will eventually be exchanged. Many Third World nations are very concerned about the role of women in those technical issues bearing on fertility regulation programs.

The challenge of technical cooperation is threefold. First, to acknowledge that technical cooperation is a forerunner of a new global division of industrialization. Second, in the choice of techniques, the development of human resources must play a major role. Finally, technical cooperation hinges on a widening of horizons: some attitudinal and legal barriers to the transfer of technology may prove more serious than lack of funds or knowledge.

What technical cooperation among developing countries is all about can be seen in one striking example cited at the conference.

A decade ago, a sociologist established the Centre for Integrated Development in a huge solitary stretch of savanna in the plains of Colombia. His aim was to evaluate the development potential of a vast semi-arid zone, all but abandoned by early colonizers, and to apply intermediate technology in an empirical and experimental fashion based on the concept of "satellite farming".

He called the Centre "The Seagulls", after the birds that make their home on the banks of the countless streams that run across the savanna. His project struck a responsive chord with the dean of the Faculty of Mechanical Engineering at the University of Los Andes in Bogota, who supplied the necessary technological research and development.

The Centre introduced farming, reforestation, and vegetable oil production in a quite unproductive region. It built windmills. Costing only US\$400, each windmill is capable of pumping up to 20,000 litres of water per day.

The researchers have succeeded in attracting some 100,000 people to colonize the huge area, without creating any ecological hazards. The Centre built its own houses, schools, hospitals, and other infrastructure — all based upon local materials and inventive technology. Hydroelectricity was introduced on the same basis of simplified technology — using a turbine capable of functioning economically with most moderate water falls.

The directors of the Centre have been travelling the world over. Hundreds of foreign experts have visited their Centre. It is a striking example of how to marry technology with employment, and employment with local resources and inventiveness.

This was the first United Nations world conference in which the Third World nations necessarily had to play the leading role. It was their conference.

And despite the inevitable polarization of views, at the eleventh hour the delegates rose to the occasion and reached consensus. In fact, the 38-point "Buenos Aires Plan of Action" was approved unanimously without any debate at all.

Whether technical cooperation among developing countries will be practiced as preached remains to be seen. There is still a dearth of concrete proposals to stir the imagination of technicians and politicians alike. But the main objective has been reached: there is a bridge across the South, a spearhead of genuine cooperation.

The Third World countries must now prove that they can indeed blend technology with employment — for the sake of their own people in whose name (it is said) technical cooperation is being fomented. □

Mr André van Dam is an economist and planner who, in his spare time, writes and publishes on Third World issues. He headed a delegation of three from the Society for International Development to the United Nations Conference on Technical Cooperation Among Developing Countries, held in Buenos Aires, Argentina, in September 1978.

Malaria

return of a deadly foe

Michelle Hibler

Malaria, the disease that 20 years ago became the target of a worldwide eradication program, is now on the upsurge. An estimated 200 million people are affected and an even larger number are carrying the infection. In Africa alone, where one patient out of eight is a malaria case, the disease is reckoned to kill one million children a year. The World Health Organization (WHO) no longer believes that malaria eradication is possible.

What happened? The chief problem is the resistance of mosquitoes to DDT and other insecticides used against them. The first mosquito species became resistant to DDT in 1951. Now, 43 species are resistant, and the resistance has spread to other chemicals. Of the 25 percent of the world's population who live in malarial areas, one-third of them — some 260 million people — live in areas where insecticide resistance is a growing problem. Latin America and Asia are the areas at greatest risk.

A second problem is that the principal antimalarial drugs, chloroquine and related substances, have little effect on the parasite that causes the most severe form of the disease, *Plasmodium falciparum*. Fortunately, drug resistance and insecticide resistance have not coincided in one area, but sooner or later such a situation is bound to occur.

An important cause of insecticide resistance in mosquitoes is the widespread use of insecticides on food crops. Because of the initial success of DDT, research and development of other insecticides has been slow, and the available alternatives are

much more costly, and often much more toxic. Unfortunately also, research has failed to turn up any dramatic new weapon against malaria. Techniques for genetic control have turned out to be extremely costly. And despite a breakthrough made in 1976 at Rockefeller University in New York, where researchers succeeded in maintaining the malaria parasite in laboratory conditions, the development of a vaccine is still a long way off.

Humans, albeit inadvertently, have helped the resurgence of malaria: man-made ditches and irrigation ponds have provided new mosquito breeding grounds; roads and improved means of transportation have brought travelers and goods from malarial areas to regions where it didn't exist before or where it had been eradicated. And because of the trust in insecticides, no systematic destruction of mosquito breeding grounds has been carried out.

Renewed interest in malaria research brings new hope. The WHO created the Special Programme for Research and Training in Tropical Diseases in 1976 in an attempt to bring malaria and five other major tropical diseases under control. Many organizations, including the IDRC, have contributed to this programme, whose activities include efforts to revive research in affected countries as well as to provide support for research on new tools for the prevention, diagnosis, and treatment of tropical diseases.

If malaria is to be brought under control, however, countries will need to go back to destroying mosquito breeding grounds as well as other measures used before the advent of DDT. Earthscan, a media information unit on environment-development issues supported by the UN Environment Programme, reports, for instance, that experiments in Mexico have shown that one species of mosquito can be almost totally eliminated by increasing the flow of water in paddies, so as to sweep away the mosquito larva resting on the water's surface. In the Peoples' Republic of China, carp are grown in paddy fields so they can eat the mosquito larvae.

If these efforts are to succeed, education and community involvement in affected areas are necessary. Only a concerted effort on the part of scientists, politicians, and the people themselves will bring the disease under control. □

An old weapon renewed

A new antimalarial drug has been successfully extracted in the Peoples' Republic of China from a medicinal herb. This is the first major drug breakthrough since the discovery of chloroquine, which is now generally accepted as the most effective drug against malaria.

The new drug, Ching Hao Su, is an antimalarial substance obtained from common apiaceous wormwood. According to ancient Chinese medical records, the plant was used for malaria more than a thousand years ago.

The research was first conducted by the Institute of Chinese Materia Medica under the Academy of Traditional Chinese Medicine. Its staff members extracted Ching Hao Su in 1972, and dozens of scientific organizations later joined the research effort. Clinical tests and experiments in chemical pharmacology and into the forms of prepared drugs were carried out, production processes were studied, and herbal resources surveyed during the course of work on the drug. During this process, the clinical effectiveness and the chemical structure of the drug were ascertained. Because of its crystalline chemical structure, which is entirely different from those of the known antimalarial drugs used throughout the world, Ching Hao Su has proved to be a completely new discovery, reports China Features, an official news service of the PRC.

The new drug can be administered orally or by intramuscular injection, and is reliable and effective. It does have a shortcoming, however: the inability to prevent short-term relapses. Efforts are now being made to overcome this defect.



Photo: Neill McKee

Malarial mosquitoes breed in any convenient body of water and constant care must be taken to eliminate such breeding grounds.

New tools for development

Louis Berlinguet

Fifteen years ago, when our marvelling world discovered the space age and a host of new technologies, it immediately began to envision the enormous possibilities offered by science and technology. Third World countries, a great many of which had just achieved their independence, saw therein a means of accelerating their development, and in 1963 the United Nations conference on the application of science and technology for the benefit of underdeveloped regions gave cause for even greater hope.

Fifteen years have gone by and the sad fact is that science and technology have not lived up to expectations and that the gap between rich and developing countries has scarcely been bridged. Something has gone wrong.

The United Nations has therefore decided to hold another conference in Vienna in August 1979 on the even more specific theme of "science and technology for development" (UNCSTD). This time, science and technology will be considered as instruments, not as ends in themselves. Of course, science and technology have made tremendous progress between 1963 and 1979, but there have also been moments of doubt, questioning and hesitation. What science? What technology? For whom? Why? Some have even claimed that there is fundamental opposition between technology and quality of life. This far-reaching reflection has been as intense in developed countries — particularly during the student riots at Berkeley and those of May 1968 in Paris and Germany — as in Third World countries, and it has brought about an important change of attitude toward international development assistance. Today, participants in international conferences speak of "technical cooperation between developing countries", which was the theme of the 1978 United Nations conference in Buenos Aires, of a code of conduct to regulate technological transfer, and of a revision of international patents agreements, in short, of a new scientific and technological order that would result from a new world economic order.

The type of technological transfer made in 1963 and symbolized by the building of turnkey factories has now been replaced by an increasingly apparent determination on the part of recipient nations to choose appropriate technologies and adapt them to their own economic, social, and cultural contexts.

It is doubtless a sign of the times that midway through this transition period Canada founded the IDRC, a new type of organization whose the basic objective was to meet the expectations of Third World countries. The concept of promoting research in developing countries, particularly research done by local teams according to their own priorities, was actually an innovation on the international development scene. The Canadian experiment has been

followed closely by developed countries, international organizations, and especially Third World countries, which have viewed it as a genuine effort to gear assistance to their own wishes.

During its eight years of existence, the IDRC has undertaken some 800 projects around the world and has proved beyond a doubt that science and technology can be used for improving living conditions in rural areas of developing countries while contributing significantly to the development of the infrastructure and local skills without which any technological transfer is impossible. The examples described in this dossier show that in every aspect of scientific and technological activity — from agriculture to information systems to health care — it is possible to transfer and communicate knowledge as well as promote the development of local research teams which will be able to work in harmony with their socio-cultural context and make a more consistent and sustained contribution to their country's development.

It is still too early to foresee the result of next year's Vienna conference. Let us simply hope that it will destroy the myth that science and technology are all-powerful and can alone solve every development problem. Politicians and other leaders should take this opportunity to learn that science and technology become effective tools only if a certain number of prerequisites have been met. Political will, a national scientific and technological policy, infrastructures and human and financial resources, for example, must all be present. Scientists, for their part, may discover that the practical problems of developing countries are too important to ignore any longer and that, since 90 percent of the research done in the world is on problems of developed countries, it would only be fair to devote a larger percentage to problems of Third World countries.

The task is not an easy one. Nevertheless, the IDRC's modest effort suggests that significant results may be achieved in the transfer of science and technology with relatively small investments. If the IDRC experience can attract the attention of other countries and stimulate the establishment of other such organizations and instruments, the contribution of science and technology will increase, thus enabling international development to forge ahead.

Louis Berlinguet is IDRC Senior Vice-President and is Vice-President of the UN Advisory Committee on the Application of Science and Technology to Development (ACAST). During the week preceding UNCSTD, ACAST will hold an international colloquium on "Science, Technology and Society: Needs, Challenges and Limitations" for the scientific community.



Photo: Neill McKee

Pea protein potential

In Upper Volta, as in most countries of West Africa, cowpeas are the most important food legume grown. Not only are they a cheap source of good quality protein, but because of their nitrogen-fixing ability they can be grown on relatively poor soils and the crop residues also help maintain soil fertility. Although cowpeas are well adapted to the savanna regions because of their tolerance to drought and short growing season, farmers only harvest, on average, 200 kg of grain per hectare. The potential for increased cowpea production is evident, as yields of two tonnes of seed per hectare have been obtained in experimental plots.

In 1971, the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, launched a Grain Legume Improvement Program to help solve some of the problems that limit cowpea production. The aim is to develop cowpea varieties that combine insect and disease resistance with high yields, adaptability to traditional cropping systems, and desired consumer characteristics.

During the past two years, IITA's cowpea collection of some 7000 varieties has been screened for resistance to insects and disease. Close to 1000 varieties have been selected and distributed for trials at 10 locations in West Africa. The best varieties will then be yield tested throughout the tropics. The improved genetic stocks are being provided to national research and extension programs in other countries, along with the technology, as part of a cooperative endeavor. For example, in Upper Volta, an IITA plant breeder is helping local staff to establish breeding nurseries and carry out field trials as well as to demonstrate the new varieties in farmers' fields.

This IDRC-supported Food Legume Improvement Program also enables staff from Upper Volta to attend training courses at IITA, and graduate students to conduct their thesis research as part of IITA's grain legume program. And because similar training opportunities are provided to young scientists from neighbouring countries with similar environments, there is every prospect that the work begun in Upper Volta will benefit the region as a whole.

Science helps fill the protein gap

Joseph H. Hulse

Ten years ago, the United Nations General Assembly adopted and published a report that called for international action to avert the impending protein crisis. More recently, a wearisome debate has gone on between those who insist that no worldwide protein problem exists or impends, and others who are convinced that protein malnutrition continues to present a serious threat to many of the world's least privileged.

Estimates of the protein available from different food sources in various regions of the world are averages of very uncertain data, and it is probable that the ranges and standard deviations are very large indeed. Consequently the least privileged, usually the poorest and most vulnerable, have access to average protein intakes considerably lower than those usually quoted.

Among the poor communities of the less developed countries, the high incidence of infectious diseases and debilitating parasites creates a greatly increased demand for protein and energy.

It is among the young children, particularly those of the poorest and least privileged communities, that protein and calorie deficiencies are most prevalent. Because both are familiar, among the poorest, clinicians now prefer the term "protein-calorie malnutrition" (PCM), which comprehends a broad spectrum of conditions associated with malnutrition.

There is strong evidence from many sources to demonstrate a significant relation between income and nutritional well-being. Some of the most acute examples of PCM are to be found among the world's poorest, and it is for this reason that the Agriculture, Food and Nutrition Sciences Division of IDRC has directed greatest concern and priority to the semi-arid tropics, most of whose inhabitants have an average annual per capita income below US\$200.

These people rely mainly on cereals, legumes, root crops, and other plant sources for most of their calories and protein, and will probably continue to do so

for many years into the future. Some of the problems that present themselves to agricultural, food, and nutrition scientists can be illustrated by sorghum, the principal cereal of the semi-arid tropics.

The average yield of sorghum throughout the semi-arid tropics is about half a ton of grain per hectare per year. Yet on experimental farms in Africa and Asia, cultivars that yield better than 8 tons per hectare are in an advanced state of development. It is by no means a simple or straightforward matter to bring together in a single cereal cultivar the genes that combine high yield, and desirable nutritional, agronomic, and technological properties together with satisfactory utility and acceptability. The first problem is to combine a high yielding capacity with functional properties acceptable to the consumer, and with desirable nutritional composition, and then persuade farmers that these superior cultivars can be grown with greater profit and minimum risk.

The protein present in sorghum as in all seed grains are of two broad classes: first, the structural proteins of the embryo which are of predetermined and invariable composition; second, the storage proteins of the endosperm, the amino acid composition of which can vary significantly. Within sorghums of similar genetic backgrounds, as the percent of protein increases, the percent of lysine (an essential amino acid) in protein decreases. Consequently, as the amount of protein goes up, the nutritional quality of the protein declines.

Recently, sorghum genotypes with a very much higher than average lysine content have been discovered in Ethiopia, and even more recently, a high lysine character has been induced by chemical mutation. Research is in progress in India and at Purdue University (Indiana, USA) to combine either or both of these high lysine genes into a stable genetic background to provide cultivars high in lysine, with average protein content, an acceptable grain quality, and high yield. But since the high lysine genotypes have a



Photo: Neill McKee

Sorghum, the principal cereal of the semi-arid tropics, is harvested for insect damage studies in Senegal.

floury endosperm that tends to chip or shatter in the abrasion-type mills used in a number of developing countries, some measure of compromise may be necessary between nutritional and technological quality.

An interesting opportunity for imaginative collaboration between the plant breeder and the cereal technologist also presents itself. The nutritional quality and digestibility of sorghum is reduced by the high polyphenolic tannin content of the seed coats. But the high tannin sorghums are generally more resistant to bird, insect, and fungal attacks. The ideal objective would be to develop sorghum types with a pericarp (outer seed coat) that resists attack yet is loose enough to be efficiently separated by abrasion milling.

In addition to IDRCs support for research in these and other aspects of sorghum improvement, we are also supporting studies in Africa, Asia, the Near East, and Latin America to increase the yield capability and utility of several food legumes. In fact, the amino acid compositions of cereal grains and legumes are complementary and a combination of roughly two parts cereal to one of legume provides a protein of good nutritional quality. Unfortunately, because of their relatively low yield, per capita production of legumes throughout the developing world is declining in relation to cereals. As with sorghums, a combined effort is required among plant breeders and agronomists to increase yields, and food technologists and home economists to devise simple technologies to enable rural processors in the semi-arid tropics to convert legumes to forms that can be acceptably combined with cereal grains.

Agricultural scientists are pursuing the goals of increased production with zeal and imagination. But though food scientists have served North Americans admirably, food science has contributed less than agricultural science to the needs of developing countries. It is therefore the postproduction system that we must now seek to improve, to ensure that the crops

are preserved, used and made available to the consumers, and that the increased harvests are conveyed safely and economically from the regions and seasons of abundance to those of scarcity.

Cereals and legumes are but two of the traditional and conventional protein sources for which there exist immense opportunities to increase production and make distribution more uniform. It is these opportunities scientists and technologists need to pursue, particularly among countries of the Third World, before we seek to discover and devise unfamiliar and unconventional food forms.

Although we are much better informed than we were 25 years ago, there remains much we have yet to learn about how much protein we need; how it can be reliably measured and evaluated; in what form and composition protein is best provided for all conditions of men, women, and children; what factors influence the digestion, absorption, transport, and utilization of protein in the human body; and how much protein and of what quality is truly available at all seasons to all those in greatest need.

Until we answer these and many other relevant questions, wise men will think twice before proclaiming that the protein problem is dead and buried. □

Mr Joseph H. Hulse is Director of IDRCs Agriculture, Food and Nutrition Sciences Division and President of the International Union of Food Science and Technology. This article is based on a paper he presented at the International Symposium on Protein Utilization held at the University of Guelph, Guelph, Canada in August 1978.

Water working

Until this year, the small village of Jedee-Thong in Thailand's Pathumthani Province faced a problem common to too many rural communities in developing countries: the 720 villagers depended on rainwater collected in jars or on water drawn directly from the muddy Chao Phraya river for their needs. But that was before Dr Nguyen Cong Thanh received a Research Associate Award from the IDRC to study the functional design of a water supply system for rural communities. A Canadian environmental engineer teaching at the Asian Institute of Technology (AIT) in Bangkok, Dr Thanh chose to "invest" a part of his grant in the construction of an actual filtration system.

The main problem in the use of tropical surface waters for human consumption is the removal of turbidity particles, mainly clay and suspended silt. The most common removal method is a rapid-rate filtration system in which chemicals are used to coagulate fine particles for further settling and filtration. However, this method is too complex and expensive to install and operate for most villages in developing countries.

The filtration system chosen for Jedee-Thong had been designed and pilot tested at AIT. It consists of a horizontal-flow pre-filter of granite chips to treat the raw water, followed by a vertical slow-sand filter to polish the treated water for human consumption.

In May 1977 the villagers, under the supervision of AIT's Physical Plant staff, began construction. In seven months, construction was completed and the system became operational in January 1978.

Both the pre-filter and slow-sand filter have been found to perform remarkably well: about 92 percent of the turbidity particles are removed as are 96 to 99 percent of the coliform organisms. The treated water is "pure like crystal", says Dr Thanh, and, according to the villagers, tastes better than rain water.

How much does this water cost the villagers? The total construction costs — covered by Dr Thanh's grant, a provincial government grant and the village council — amounted to some US\$5,000, or about \$30 for a family of six. The system now provides 50 litres of water per person per day at an operating cost of \$80 a month.

It is expected that the new water system will lead to the development of a total sanitary program for the village.

Linking science and industry

Jean-Marc Fleury

History teaches us that many areas of the world invented and perfected a host of original techniques long before the European industrial revolution spread around the planet. Artifacts and documents prove, for example, that craftsmen in East Africa, India, China, and the Near East discovered independently of each other, and in many cases before the Europeans, how to transform iron ore into steel.

But historical hindsight of these accomplishments is small consolation for the regions that have, in the meantime, become "developing countries" that now import their scientific and technical knowledge from a few major centres.

The technological process that was once tightly woven into the fabric of their civilizations has been snapped short. Science and technology are now acquired from abroad, as 90 percent — or as much as 98 percent, according to some — of scientific research is carried out in the industrialized countries. Having already experienced a political and economic domination built on force, many countries are concerned that a monopoly in science and technology will continue the hegemony of these power centres. A number of researchers in the Third World are wondering, therefore, how to restore the native scientific and technical vigour of their countries.

The Latin American countries were among the first to organize themselves in order to acquire the tools that would permit them to appropriate modern science and technology. It was therefore fitting that one of the most ambitious studies ever undertaken of the scientific and technical policies of developing countries should begin on that continent. The

Science and Technology Policy Instruments (STPI) study, coordinated by a Peruvian, Francisco Sagasti, has mobilized researchers from ten countries, not only Mexico, Peru, Venezuela, Argentina, Brazil, and Colombia in Latin America, but also India, Korea, Egypt, and Yugoslavia.

"Governments have tools for influencing the economic sector", says Francisco Sagasti. "Our objective was to identify similar instruments in order to translate general scientific and technical policies into concrete terms." Sagasti, who has been coordinator of the STPI project for several years, explains that the need for such a study was prompted by the meagreness of results achieved in a number of countries in spite of their adoption of scientific and technical policies, and the great sacrifices they made in order to train scientific personnel. "National researchers complained they were not being consulted, because most of the technologies used in their countries were imported." This involuntary unemployment of researchers pointed up the missing linkages between the developing countries' research and development resources and their industries.

The final report of the STPI project tells how indigenous researchers, disappointed that no one was calling on them, turned their energies towards the creation of a university research apparatus in which they were free to work on whatever they chose. Thus, the research budgets of the developing countries were in large part devoted to pure research. The report cites the example of the directors of the Venezuelan Association for the Advancement of Science, who only very recently accepted that national socioeconomic priorities should guide their efforts.

National leaders were well aware of the problems caused by the absence of adequate links between the local scientific apparatus (supply) and industry (demand). Various measures were advocated and a certain number of additional instruments were introduced. But it was still difficult to measure the real impact of the policies adopted. That is why it became necessary to gather multidisciplinary teams within the framework of the STPI project in order to identify, classify, and describe in detail all of the science and technology policy instruments available to governments.

The project undertook a very great number of studies, which have now been completed. The final report indicates, among other things, that in most countries indirect instruments have overtaken direct instruments. Moreover, the indirect instruments, such as industrial financing, use of government purchasing power, and the setting up of tariff barriers, were applied to all industrial activity, without taking into account the fact that some industries are doubtless more important than others to the development of a country. For example, indiscriminate, blanket application of tariff policies

to a host of imported products has been common. For their part, the direct instruments, including research laboratories and training programs for scientific personnel, have had a much lower impact than has been expected of them.

The final report also tells how one of the most popular industrial development policies, import-substitution industrialization, could bring about foreign domination of technical development. When the desire was to locally produce exact copies of imported products, the machines that manufactured these products inevitably had to be imported. After pointing out the danger presented by import-substitution industrialization to scientific and technical development, the study stresses the importance of stimulating demand for the services of national experts and research centres by designating certain sectors of the economy to make use of and develop traditional techniques, and by pursuing a vigorous government "buy domestic" policy. Use of local consultant firms, redefinition of standards and norms in the context of local conditions, programs of loans for innovation, and control of foreign investments constitute a number of other powerful instruments available to the country that wishes to match its scientific resources to its needs.

Nevertheless, the report makes no illusions about the development of the scientific and technical potential of the developing countries. It acknowledges that a few countries are breaking free: in India, Brazil, and Korea, a restoration of local technological vigour is well under way. On the other hand, the report recommends that most countries assign a priority to acquiring the resources that will allow them to import foreign technology to their advantage. The study states that governments have more room to manoeuvre in this area than they generally believe. Scientific and technical expertise that is capable of determining whether or not the importing of a given technology is in line with national objectives should be the favoured instrument, according to the report.

Lastly, although the final report offers no easy solutions, it at least draws up a complete list of the factors involved in science and technology policy. It also provides access to some 200 studies on the industrial sectors and policy instruments of the countries that were included in this vast study over its term of four years. □

Services meet needs

Michelle Hibler

During the past few years a number of experiments have been carried out to devise systems of health care that are accessible, acceptable and affordable. Most rely on village health workers and other local resources. The IDRC has supported experiments of this kind in more than 10 countries of Asia, the Middle East, Latin America, and the Caribbean. But experimentation is only one side of the coin. If these systems are to be successfully extended outside the test regions, they must be carefully analyzed and evaluated.

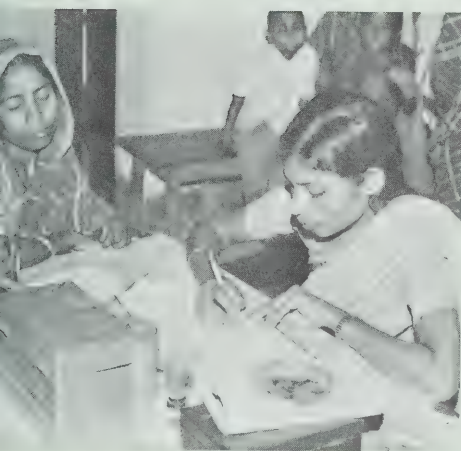


Photo: Neill McKee

In 1972, when the Christian Medical Commission became interested in supporting a medical relief program in Bangladesh, it was decided to test the feasibility of integrating health and family planning services under a single regional administration and a local health committee. Curative and preventive health services would be delivered by locally recruited and trained workers, and by existing health and family planning workers who would be retrained. The project became a joint venture of the Bangladesh government and the Christian Commission for Development in Bangladesh, which was established in 1973.

The Companyganj Thana, a region of 120,000 people on the Bay of Bengal — one of the most conservative and needy parts of the country — was chosen for the experiment. The area had a rural health centre but it was underused because of a shortage of staff, equipment, and medicine. The Family Welfare Workers, responsible for malaria and smallpox eradication, were scarce, as were the family planning workers.

A first step was to renovate and equip the government rural health centre at Basurhat. Three cyclone shelters were made into sub-centres and three more were built on land donated by the community. One of these in the southern part of the Thana became a major sub-centre, staffed by nurses, paramedical staff and auxiliaries, and visited biweekly by a doctor from the health centre.

Soon after the program was launched, late in 1973, a considerable increase was noted in the number of patients visiting the health centre clinic. Most came with problems that health auxiliaries could identify and treat — malnutrition, diarrhea, skin diseases, respiratory tract infections, and parasitic diseases. Paramedics were therefore recruited and trained for this task, and Family Welfare Workers were instructed to emphasize home treatment of these diseases.

Unexpectedly, only five percent of the patients were children under three, and few women came with gynecological problems or pregnancy. Female auxiliaries were therefore sought to handle maternal and child care and family planning work as well as the treatment of minor diseases. This posed somewhat of a problem since *pardah* (seclusion of women from public observation) was strictly followed in the region. The wives of the male staff were eventually persuaded to take the positions but they confined themselves to the clinics. Once it was established that the jobs were respectable, however, the barrier was broken and applications outnumbered the job openings.

Sub-centre clinics for women and children were set up in five regions to immunize children under three, follow their development and, if needed, distribute food supplements — a mixture of wheat and chickpea flours. Maternal care and family planning services were provided both at the clinic and during home visits

carried out three days a week. More recently, traditional birth attendants in one area have been retrained in hygienic delivery methods and antenatal care. It is hoped to continue this program throughout the Thana.

In fact, the intensive field work and home visiting, focussing on family planning, is a particularly exciting feature of the Companyganj project. All the male personnel have been retrained to provide basic services, including family planning, on a house-to-house basis. The village women who have followed short training courses in family planning, maternal and child health, and nutrition have also performed well. And they have been enthusiastically received by the men in the area who see in this program the potential for something that will finally meet the needs of their wives and children.

The original grant from British and German church agencies provided support for the service program. It was felt, however, that research and evaluation were essential to determine the different social and medical factors related to health and family planning and to evaluate the program itself.

The Ford Foundation provided a grant for demographic studies and, in mid-1975, the IDRC provided funds to evaluate the project from a functional point of view. This functional analysis was undertaken in order to provide a basis for modifications and future recommendations, and to facilitate the transition to Bengali leadership.

The evaluation unit has been carrying out regular surveys of demographic events. Since 1977, studies of illness episodes, costs, and content of health care services have also been undertaken to match the needs of the area to the services provided. The data are now being analyzed and a full report should soon be ready.

While it is difficult to draw definite conclusions until all the information is analyzed, some results are obvious. Attendance at the clinics has increased, particularly in the case of women and small children. It is estimated that at the end of 1976 — three years after the project began — 18 percent of the couples were practicing family planning. Significantly, 90 percent of them had been motivated and recruited by field workers during home visits.

According to one member of the project team, Dr Shafiq A. Chowdhury, the project has amply demonstrated that private organizations and government can effectively work together. It has also shown that with adequate support, primary health care and family planning services can be given by locally recruited persons with little formal education and no previous medical background. And, by linking services with the needs of the area and providing them in a way that fits in with the people's culture and traditions, real improvements can be made.

□

Sanitation

a choice of technologies

Rowan Shirkie

The flush toilet, and the waterborne sewage system that developed along with it, are probably two of the worst detours on which technology has ever taken human progress.

Consider the absurdity of a system where wastes are dumped into water supplies that then require staggering investments of time and money to purify again in order to use for drinking, cooking, and washing.

Consider also that some 1300 million people (about 67 percent of the population of developing countries) lack adequate facilities for the disposal of human wastes, and that the consequent unsanitary conditions produce high disease rates and an estimated 25,000 deaths per day.

And consider too, that even if communities in developing countries had the water resources to support the extravagantly inefficient conventional sewerage systems now available, the cost would be about \$200 billion in construction costs alone.

A technology, or technologies, that could provide basic sanitation services at a reduced cost — in terms of expending economic, physical, and social resources — would have a profound positive effect on the health of people and their environment.

IDRC and the World Bank recently collaborated in preparing a bibliography and state-of-the-art review of alternative sanitation technologies that could be used in an effort to correct present deficiencies, and avoid the sort of inappropriate solutions that might overextend community resources. The search focused on innovative approaches to collection, treatment, reuse, and disposal of human wastes in urban (and rural) environments in developing countries.*

Permanent or periodic shortages of water in many developing countries pose severe restrictions on the adoption of any waterborne system. Hot and humid climates also create ideal conditions for the survival of disease causing organisms in human wastes. Poor sanitation in this environment, coupled with endemic malnutrition, is probably the chief cause of the spread of hookworm, diarrhea, enteritis, cholera, and typhoid. The destruction of pathogens in wastes is therefore the first priority of any disposal system in



A pit privy being built in Tanzania. This is probably the most widely-used method of human waste disposal.

Photo: Neill McKee

the tropics. As technologies now exist to convert waste material into valuable fertilizer and energy products, and given the importance of both agricultural and energy needs in developing countries, reuse considerations must also become a priority in disposal systems.

The options for low cost sanitation in developing countries seemed to the investigators to fall into three main categories: waterborne options, cartage options, and on-site options.

Waterborne options, that is sewerage systems, are as yet the only solution identified for high-density highrise housing and commercial areas. The concentration of population in these areas tends to minimize the drawbacks associated with sewerage; provision of piped water (usually available in such environments), and cost (the unit cost is reduced in serving a concentrated population). Tied to intelligent water-saving and reuse practices, well managed sewerage systems can be viable options.

Cartage options operate on the same principle as sewerage — removing wastes to locations outside of inhabited areas for disposal or treatment — but without the use of pipes. Such systems consist of a household sewage vault that is emptied periodically by vacuum trucks or smaller pumping carts. Such collection systems are more suited for certain urban sanitation needs than sewerage: capital outlay is low, about a third that of sewers; the

system always operates at or near capacity; is labour-intensive; and provides a high level of service when properly operated. Such systems are widely used in Japan and Taiwan, and in cities such as Sydney, Australia, and Oslo, Norway.

On-site options, generally suitable for urban and rural application, can be implemented and operated by individuals. These are basically variations of the pit privy — probably the most widely used technology for excreta disposal — with improvements to environmental and hygienic conditions. Composting toilets, wherein solid organic wastes are biologically converted into a stable, humus-like product, are a promising alternative.

Composting on a larger scale, together with waste stabilization ponds, are two treatment possibilities that offer flexibility and low cost. Waste stabilization ponds are shallow rectangular lakes in which wastes are treated by natural processes based on the activities of bacteria and algae. Both methods are effective in destroying pathogens, and offer reuse possibilities.

Reuse, or recycling of resources such as wastes is already widely practiced in developing countries, not so much for reasons of environmental conservation, as in response to the pressure to exploit every resource potential to its fullest to meet needs. Reuse of human waste may be undertaken through fertilization of crops with treated and untreated night-soil, irrigation with sewage and stabilization pond effluents, fish and algae production based on wastes, and the generation of biogas.

Sewerage has long been regarded as a universal solution to waste disposal. It is assumed that the technology need simply be introduced to produce a predetermined, predictable result. But sanitation engineers and managers (along with others in different fields) are discovering that their accepted universals break down in developing country contexts. The best, and often the only, solutions arise from an understanding of the unique characteristics of the problems encountered, and take into account the local human and material resources available to solve them. The investigators believe that a step-by-step upgrading compatible with existing sanitation conditions will prove the best approach. Their approach — adaptation, rather than just adoption — implies a dynamic process of problem solving that can produce benefits wherever science and technology are brought to bear on development.

□

*IDRC has recently published *Low-cost technology options for sanitation: a state-of-the-art review and annotated bibliography* by Witold Rybczynski, Chongrak Polprasert, and Michael McGarry. A companion volume, *Health aspects of excreta and sullage management* by R. G. Feachem, D.J. Bradley, H. Garelick, and D.D. Mara has been published by the World Bank (Energy, Water and Telecommunications Department, 1818 'H' Street NW, Washington, D.C. 20433, USA).

Sharing knowledge for development

John Woolston

If the information needs of the developing countries are to be met, their key personnel (planners, researchers, administrators, etc.) must have access to two types of service. A "Type-One" service provides an essentially comprehensive inventory of the information available in a particular field. As even in a defined field, many hundreds of thousands — even millions — of documents may exist, the inventory must be indexed to a sufficient degree to enable one to pick out those items that relate to a specific need, i.e., information on a particular specialized topic or a particular situation. A "Type-Two" service is one that takes the available information on a relatively specialized topic, evaluates it, selects what is significant, brings together complementary material from different sources, and puts out products that convey needed information in the language of the client and at their level of understanding.

The Type-One (inventory) systems have been with us for many years in the more industrialized countries. *Chemical Abstracts* has for decades provided chemists with a virtually complete index of all available chemical information. *Index Medicus* provides an inventory of the medical information acquired by the National Medical Library of the United States. Developing countries are now beginning to play their part in the operation of Type-One systems but, as none of these countries could be expected alone to manage anything on the scale of *Chemical Abstracts* or *Index Medicus*, their involvement comes through participation in international cooperative systems.

The model for the international cooperative system is one that was started in 1970 by the International Atomic Energy Agency (IAEA), known as the International Nuclear Information Service (INIS). Any interested country is invited to participate by reporting the relevant new information generated on its own territory. Reports from all the participating countries are merged by the IAEA, and the complete inventory is available to each of them. This inventory is produced on magnetic tape for those who wish to search it in a computer system, and also made available in the form of printed lists with elaborate indexes.

In 1975, the Food and Agriculture Organisation (FAO) started a cooperative information system known as AGRIS, following the INIS model. Here again, all countries are invited to participate by reporting the new agricultural information produced on their own territories, and a consolidated, indexed inventory is put at the disposal of each of them. The IDRC has invested heavily in supporting developing countries that wish to participate in AGRIS. Most of this support has been channelled through regional resource centres established by the developing countries themselves. In Latin America, the Centro Interamericano de Documentación e Información Agrícola (CIDIA), San José, Costa Rica, provides training and advice for the Latin American countries; it has also prepared Spanish-language versions of the AGRIS instruction manuals. The participating countries report the new items of information issued in their territories, from which CIDIA first constructs a Latin American file with Spanish-language indexes. This file, known as AGRINTER, is processed on a computer in San José. On behalf of the participating countries, CIDIA also forwards the Latin American records to FAO so that they can be merged in AGRIS. Participating countries throughout Latin America therefore, now have access to inventories of agricultural information prepared both regionally (AGRINTER) and globally (AGRIS).

A similar situation prevails in Southeast Asia where countries have set up an activity at the Southeast Asian Regional Centre for Research and Graduate Study in Agriculture (SEARCA), in Los Baños, Philippines. Known as the Agricultural Information Bank for Asia (AIBA), this program provides training and other resources to the individual participating countries, processes records of information collected in the region, produces a regional indexed inventory (*Agriasia*) and forwards records for inclusion in AGRIS.

AGRIS is now adding more than 10,000 items a month to its inventory. Thus, in the last 2-3 years, the developing countries of Latin America and Southeast Asia have acquired much more ready access to an accumulated store of knowledge in agriculture — what is for them the most important of all fields of economic activity and employment.

Other areas of activity, both economic and social, are also of great interest to the developing countries. Proposals have been advanced for the establishment of cooperative information systems dealing with topics such as public health, water and sanitation, education, economic and social development planning, etc. IDRC is working with the various groups that are seeking to design and implement such systems. Perhaps the most interesting recent example comes again from Latin America. With some financial support from IDRC, the United Nations Economic Commission for Latin America (ECLA) will, during 1979, design and demonstrate a system that would serve the information needs of Ministries of Planning of the region.

Although Type-One services require cooperation to ensure that all sources of information are taken into account, in Type-Two (customized) services, the most important requirement is that the staff involved are themselves highly knowledgeable in the subject matter. It is necessary, therefore, to make such services highly specialized and to locate them at what is a "centre-of-excellence" for research into the subject matter. The concept of the "information analysis centre" dates only from the 1950s and, hence, very few can be found in the developing countries. IDRC has devoted considerable resources to the establishment of specialized information analysis centres in the developing countries on topics of priority interest to these countries. Most of the new centres deal with agricultural topics, the model being the Cassava Information Centre at Cali, Colombia. This centre is hosted by the Centro Internacional de Agricultura Tropical (CIAT). The Cassava Information Centre has made a comprehensive collection of relevant information, and it is in communication with most of the cassava scientists throughout the world. It issues bulletins identifying new information, publishes a newsletter, produces state-of-the-art reviews and manuals, and operates a question-and-answer service responding to enquiries from various sources.

IDRC has also supported the following Type-Two centres: Grain Legumes Information Centre, Ibadan, Nigeria; International Irrigation Information Centre (IIIC), Bet Dagan, Israel; Sorghums and Millets Information Centre, Hyderabad, India; Coconut Information Centre, Lunuwila, Sri Lanka; Asian Packaging Information Centre, Hongkong; Asian Information Centre for Geotechnical Engineering (AGE), Bangkok, Thailand; International Ferrocement Information Centre, Bangkok, Thailand; African Soils Information Centre, Bangui, Central African Empire. Progressively, host institutes are recognizing the value of specialized information analysis centres and are incorporating them into their regular programs. □

John Woolston is Director of IDRC's Information Sciences Division.

A case in point

The transfer of technology, nationally and internationally, is as important as research. In fact, for small industries it may be more important, as the answers to most of their technical problems are already known. To facilitate the application of this knowledge, IDRC has funded TECHNONET Asia, a network of 11 organizations in 9 countries that aims at improving the quality and efficiency of production in small and medium scale industries through the transfer of technical information and the provision of industrial extension services.

How the services provided by TECHNONET aid these industries can readily be seen by the following example, reported in a recent issue of *TECHNONET Asia Newsletter*.

Phoenix Silk Mills, set up in the Bangladesh Small and Cottage Industries Corporation (BSCIC) Industrial Estate in Dacca, went into operation in January 1976. Equipped with modern preparatory machinery and equipment and power looms, the factory produced grey cloth for saree and plain cloth for ribbon using synthetic yarns and cellulosic fibres such as nylon and polyester. The cost of the product was very high, however, and could not compete with printed and imported fabrics.

The company approached BSCIC, a member organization of TECHNONET, for assistance. Mr Shah Alam Chowdhury, the estate manager and textile expert and a graduate of INDEXTRAC, the industrial extension training course offered by TECHNONET, visited the factory. He found that the factory had no finishing equipment and produced fabrics for which the demand was poor and the price low.

He therefore suggested that the company experimentally open a screen printing section for printing their plain fabric, and he provided them with the necessary technical know-how as well as a supply of designs from BSCIC, free of charge. The experiment proved successful and the company has now started a full-scale printing section, which also handles fabrics from other local manufacturers.

Following his advice, modifications were also made to the layout of machinery and equipment. As a result, the efficiency and profitability of the company have been greatly improved and plans are now being made for further expansion.

A leafy paradox for science

Gunnar Poulsen

The capital of Ethiopia at Addis Ababa owes its existence to a tree. The tree owes its existence to the shrewdness and determination of the Ethiopian peasant farmer.

Between those two facts lies a history of development that could serve as a lesson for those who believe that adapting science and technology to meet the needs of rural people is a job that can only be managed by "experts".

In efforts to halt environmental destruction, and provide fuel and building material, forestry departments in Africa have been producing millions of tree seedlings for distribution to villages at subsidized prices, or even free of charge, hoping to encourage individuals and communities to plant more trees. They have met with little success. An outstanding (and upstanding) exception is Ethiopia, where an estimated 50-100,000 hectares of Eucalyptus plantations have been established. Almost all of this vast rural afforestation was accomplished before Ethiopia had elaborated its professional forestry service, by illiterate peasants using methods that would make a "properly trained" forester cringe.

Cattle rearing and crop farming, dating back nearly 3,000 years in Ethiopia, placed the country's once great forests in competition with agriculture for arable lands. The pressure on land was greatest around the cities. When all the land within "donkey and mule reach" of the city had been denuded, and erosion and water shortages began to take their toll, inhabitants moved to where the forest was still intact. The capital of Ethiopia was shifted several times over the course of history in this fashion. The fact that Addis Ababa finally became the permanent capital city, and not just another itinerant government waystation, may be due in large part to the introduction of the Eucalyptus tree in 1905. An assured supply of wood, and the protection of water supplies and land brought the wandering city to a halt.

Scattered specimens of large trees of a number of species seem to indicate that some trial-and-error experimentation was carried out before deciding on the species that seemed best adapted to local conditions and requirements. Present day Ethiopian farmers know and plant only

two species. Above 2000 metres sea level, they use *E. globulus*, and at lower altitudes, *E. camaldulensis*. *E. camaldulensis* is grown not only under arid conditions where its tolerance makes it a seemingly obvious choice, but also in areas where the annual rainfall exceeds 1000 mm. Growing this tree in heavy rainfall areas confounds most scientists, who would opt for other species known to thrive and produce straighter stems under such conditions.

The explanation is very simple. The two species of choice, better than any other, combine a good adaptability to climate and soil with the necessary toughness that enable them to survive the peculiar planting techniques applied by Ethiopian farmers. It's all wrong scientifically — but it works and serves the need.

Ethiopian farmers rarely obtain potted nursery stock from government supported nurseries; instead, they grow the Eucalyptus plants themselves or buy them from an enterprising neighbour. Nursery beds are carefully prepared, tended, and protected from harsh sunlight, rainfall, and wind. At the end of about a year, the seedlings will be approximately 0.75 metres high, very slender and with few side branches, the result of crowded growth on the seedbed. The ground where the seedlings are to be planted is worked, usually by hand, to provide a loose soil structure that is well aerated and drained. Having prepared the area for planting, the farmer waits for ideal weather conditions: a cloudy day with no wind, preferably with a slight drizzle falling.

The plants are lifted from the nursery bed by means of a small forked hoe, damaging the delicate root systems as little as possible. The long slender stems are not pruned back, nor stripped of any leaves. The farmer simply bundles the plants together as they are and carries them to the planting area. From a scientific perspective, the plants are doomed. The root/shoot ratio is too low, and further threatened by the unavoidable damage suffered during lifting and transportation. A professional forester would not expect that the more or less mutilated root system would be able to sustain the evapotranspiration of the long stem. And the



Photo: Gilles Lessard

trees are planted very close together, with a density of between 40-100,000 seedlings per hectare. For the professional forester, even 10,000 seedlings per hectare is too dense.

And if one visits an Ethiopian farm plantation a couple of days after planting, it would seem that the scientist is right. The topshoots of the plants are hanging down limply and some of the leaves are beginning to wither. Surprisingly, however, as many as one-quarter of the plants survive the rough treatment — sometimes even half. The farmers expect these losses. If the final result of their efforts is a plantation containing 10-25,000 plants per hectare, they are pleased.

The dense plantation will close canopy within a few months, eliminating the problem of severe grass competition and making weeding unnecessary. And if the trees remain small and slender, so much the better — they yield a product much in demand. Small wood dimensions are a major component of rural Ethiopian houses, which are of a mud-plastered wattle type, and are also used in considerable quantities in the erection of non-wire fences. The farmers' dense stands will yield these products first in abundance, and later also produce the larger dimensions, marketed as fuelwood and building poles.

In the neighbourhood of Addis Ababa, considerable areas of level farmland have been reforested with Eucalyptus within the last 20 years because the owners have found that they can make more income from the trees than from wheat or barley crops. Thus the tradition of 3,000 years is reversed.

Rural afforestation is a success in Ethiopia because techniques have developed that match local conditions, including the psychology, educational level, and resources of those applying them. The lesson of the Eucalyptus is plain: science or technology must be measured against the real human needs that they are meant to serve.

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Beyond the pill

David Spurgeon

Two new contraceptives now undergoing field trials show promise for family planning programs in developing countries. Both are examples of how modern medical technology can be designed to respond to personal and cultural needs in this most intimate area of health care.

The devices were described to the October meeting of the IDRC Board of Governors by Dr Elof Johansson, Dr Wayne Bardin, and Dr Anibal Faundes, world experts in contraceptive technology who sit on the Population Council's International Committee for Contraceptive Research (ICCR). Dr Bardin is chairman of the ICCR, Dr Johansson is head of the department of obstetrics and gynecology at the University of Uppsala, Sweden, and Dr Faundes is professor of obstetrics at the University of Campinas, Brazil.

The contraceptives are the subdermal implant and the vaginal ring. Both contain steroids that are released over a period of time to enter the body's bloodstream and block ovulation.

The subdermal implant is a small tube containing norgestrel, a component of the birth control pill that contains no estrogen and thus avoids most of the pill's side effects. It is placed under the skin (usually on the inside of the forearm) by means of a hollow needle containing a plunger. The contraceptive effects of the implant could last for as long as five years.

The vaginal ring is made of plastic, is somewhat smaller in diameter than the commonly-used diaphragm, and can be inserted and removed easily by the woman herself. The ring's contraceptive effect lasts approximately six months.

When the vaginal ring is removed, vaginal bleeding occurs, just as it does when a woman stops taking the contraceptive pill. Many women may want to remove the ring once a month to produce a kind of menstrual bleeding, Dr Johansson said in an interview, because women have been conditioned to believe that such bleeding is a natural function and therefore necessary.

However, Dr Johansson added that it is not really necessary to remove the vaginal ring and thus cause vaginal bleeding: the ring could be left in during the whole six months, in which

case only what is called "breakthrough bleeding" or even none at all would occur.

Vaginal bleeding is the primary problem with the subdermal implants because it is completely unpredictable. If it persists, however, the implant can always be removed. And even when women with the implant do bleed, the total volume of blood lost is less than occurs with a normal menstrual cycle — an advantage for Third World women because they are often borderline anemics.

These new contraceptives have other distinct advantages for use in the Third World. The implants are put in place by injection, similar to injections of antibiotics and other medications. This is a form of medication thoroughly approved of by Third World peoples, whereas Western peoples are primarily pill-oriented.

The ring uses natural estrogen, which does not get broken down while being absorbed, as it would by the liver if this steroid were taken orally. And being a natural steroid, it does not cause the wide range of side effects the synthetic steroid causes.

Obviously, distribution of the vaginal ring poses more of a problem in the Third World than does the subdermal implant, because the effects of the ring last only six months compared to the implants' five years. But the ring has other advantages: its use is under the complete control of the woman, who can remove it when desired — even during intercourse if she or her partner prefer (although it does not interfere with intercourse). The individual cannot take an overdose of steroid, and there is no great risk of side effects. Theoretically, the ring could quite safely be sold in grocery stores, without prescription.

Large-scale field testing is still necessary for both new contraceptives, however. An international study is going on in eight centres comparing two different sizes of vaginal ring with low-dose contraceptive pills. These are being carried out in Brazil, Chile, the Dominican Republic, Nigeria, India, Denmark, Sweden, and the United States. Testing is also underway to determine whether the device will cause local reactions in the vagina.

Both contraceptives have a physiological advantage over the pill. Because steroid dosage is sustained and even over a long period of time, these methods avoid the sudden peaking effects produced by the pill every time the pill is taken. For this reason, medical researchers are looking to such methods as potentially valuable for administration of other drugs, such as insulin or antibiotics.

When the two new contraceptives come on the market, Third World users will be assured of supplies at a low price, thanks to the iccr. The committee, set up to develop leads on new contraceptives — particularly those not of interest to industry — also protects the public sector market rights of these products. It does this by allowing commercial firms to make use of its research provided they will agree to sell the products at a fixed low cost to the public sector in developing countries. (The public sector is defined as government and family planning and similar agencies).

For example, one of the committee's developments was the Copper-T intrauterine device, which is now available in developing countries at a fraction of the cost it is sold for in the West. The saving to the Indian government was \$4 million over what it would have been if the government had bought the Copper-T through commercial outlets.

After identifying a potentially useful new contraceptive, the committee decides where research should be done on it, usually designating three centres in different countries. If all three produce similar results, the future for the device looks good — if not, more research must be done. □

In December 1973, IDRC approved a 2-year grant of \$500 000 in support of the research activities of iccr. During 1974 and 1975, important advances were made in several areas of contraceptive technology, including the female implant, vaginal rings, sperm suppression in the male, and intrauterine devices (the Copper-T is, in fact, the first contraceptive to be developed and marketed for the public sector by a nonprofit organization). Early in 1976, a second grant was approved, allocating \$3 000 000 over 3 years to further pursue the most promising research leads. A major research and development program was mounted to determine the safety, effectiveness, and feasibility of a vaccine employing human chorionic gonadotrophin (hCG) in the prevention of pregnancy.

Science demystified

David Suzuki

Today, the most powerful force shaping the lives and destinies of all people on this planet is science, applied through medicine and technology. The explosion of information, accumulated by a scientific community that is now larger than the total of all other scientists who have ever lived, is feeding ideas and techniques to the military and industry at ever accelerating rates. It is sad but true that during the time it takes to read this article, so much new information will have been generated that you will know relatively less of the total body of scientific and technological information than you did when you began.

A brief list of some of the technological inventions that have been applied within the past three decades, and have forever altered the course of social evolution, illustrates science's power: the release of nuclear energy, oral contraceptives, microcomputers, jet planes, videotape, rockets, amniocentesis, satellites, television, tranquilizers, polio vaccine, antibiotics, DDT, transistors, lasers, and petrochemical products such as plastics. With each innovation, cultural mores that have evolved over centuries are suddenly rendered obsolete. But while our distant ancestors often had millenia to adapt to each discovery — the control of fire, toolmaking or pottery — we encounter invention after invention with such stunning rapidity that we have in fact come to expect, even anticipate, surprise and novelty and the consequent conflict with old values and customs or their replacement. And while governments attempt to cope with the problems of unemployment, inflation, and social unrest, the transcendent forces of science continue to fuel them.

Looming over all global issues are the two spectres of nuclear war and massive and irreversible environmental degradation. Stimulated in the pursuit of power and profit by scientific enterprise, the military and industry contribute mightily to these twin threats.

How then, can we come to grips with science to ensure that it is applied for the benefit of humankind?

In countries with a long and rich history of science — peopled with names like Newton, Darwin, Curie, Pasteur, Einstein, Planck, Bohr, Heisenberg and Galileo — it has been an integral part of the culture. In that sense Canada is like

the lesser developed countries, having entered the technological age only within the past half century. Lacking a culture that accepts science as an integral component, Canadians have perceived a gulf between scientific research and the life of the average person. Although profoundly affected by science, the layperson considers that it is beyond his or her ability to understand.

It is my firm belief that if they do not understand the nature of scientific research and its fundamental principles, people lose all hope of directing their own destinies. If they do not understand the scientific aspects of issues such as nuclear energy plants, environmental carcinogens, oil exploration in the Arctic, supertankers, and pollution by mercury, asbestos, or PCBs, Canadians will make ill-advised decisions about the future.

For the populations of developing countries, science holds the solutions to problems of overpopulation, inadequate nutrition, unplanned urbanization, energy shortages, pollution, lack of transportation, and poorly distributed health care. But the solutions will greatly disrupt the lives of ordinary people. In order to anticipate and direct these disruptive changes, the public must be familiar with science. Here television and radio have a key role to play. Ideas in science — whether it is black holes, the structure of atoms, the ecology of our skin, or the function of the brain — are as awesome and mindstretching as the most imaginative work of fiction. Numerous polls and surveys attest to the broad appeal of programs dealing with science, medicine, and nature. As well as entertaining and educating, such programs demystify the scientist, revealing him or her as a fallible human being with emotions and limitations. Such programs can also reveal the nature of the relationship between science and industry, medicine, the military, or other sectors that will apply that knowledge. It is only by bringing science into the mainstream of daily life and removing the mantle of mystery surrounding scientists that people will be able to make science benefit all humanity. □

A distinguished geneticist and professor, Dr David Suzuki is the host of popular radio and television programs that aim to promote a better public understanding of science.

Agriculture:

A challenge for change

David Spurgeon

How do you feed the two billion people in the world's less developed countries when their food grain deficit, already some 37 million tons in 1975, is expected to increase to between 120 and 145 million tons by 1990? And how do you do it without either destroying their own agricultural sector's incentive or introducing unwanted and deleterious side effects into their cultures?

That was the "Challenge for Change in Third World Agriculture" discussed at a September seminar in Edmonton, sponsored by the Alberta Institute of Agrologists and the IDRC. The seminar was held at the University of Alberta and attracted an audience of some 200 and a press corps numbering about 20.

"There can be no doubt at all that the long-term solution to this food deficit will be found only in increased productivity within the LDCs themselves", the Centre's president, Ivan L. Head, said in opening the seminar. "Indigenous production must become the primary source of supply. It is the recognition of that fact that has shaped the program for this seminar.

"It is equally obvious, however, that a deficit of the magnitude forecast cannot be met in that timespan without massive food transfers from the developed countries in order to prevent further deterioration in already inadequate diets."

The problem of how to supply such food aid without, as Mr Head put it, "unconsciously building in a series of deleterious aberrations" was the theme of one of the seminar's two panels.

One partial solution to the food problem was described by Dr K.F.S. King, director-general of the International Council for Research in Agroforestry (ICRAF), which was founded recently on the initiative of the IDRC. Dr King defined agroforestry as a land management system that increases productive yields by combining food crops, trees, forest plants, and animals on the same piece of land. He said the management practices used are compatible with local methods of culture.

Agroforestry should be employed on ecologically brittle lands that are only marginally useful for conventional agriculture, Dr King said. These included the arid and semi-arid regions on which deserts continually encroach, areas where shifting cultivation is practised, tropical pasture lands, and mountain areas where there is little vegetation.

Dr King underlined the need for agroforestry in these areas by noting that the developed countries now possess a larger amount of arable land per unit of population than developing countries despite the fact that their share is only 36 percent of the world's total. In the year 2000, the developing countries will be required to feed 79 percent of the world's population with 64 percent of the world's arable land.

"At the end of this century, the developing nations, even if they are able to afford to utilize all the best land in their countries, will have to support a larger

proportion of the world's population than they now fail to do", he said. "Put in another way, a unit of land in the Third World would be required to support more than twice the number of people that a comparable unit of land in the developed world will be called upon to do."

There are also imbalances in resources between the developing countries themselves, Dr King said. Asia is the most densely populated developing area, yet it possesses the smallest area of potentially arable land. Fully 83 percent of its potentially arable lands are already being cultivated.

Agroforestry has been practised in one form or another for centuries, Dr King said, but the efforts to devise a coherent land management system out of the welter of sometimes conflicting information and opinion about various agroforestry practices are new. Much research remains to be done to identify and incorporate into agroforestry systems the various necessary elements: agricultural species tolerant of various degrees of shade; trees and plants that help prevent soil erosion; optimum spacing arrangements for trees and agricultural crops; and multipurpose trees that yield not only wood but other products. Agroforestry must not be viewed as a return to primitive methods but as a modern adaptation of traditional farming and forestry technologies that have proved effective in resource management, environmental conservation, and food production.

Peter Walton, plant breeding specialist and chairman of the plant science department of the University of Alberta, noted some of the contributions his specialty could make to alleviate the world food crisis. "One of the most important tasks of the next 10 to 15 years will be to decrease dependence on the feed grain-animal-consumer food chain." The first thing the plant breeder can do is to help improve the nutritional quality of plants, for example, by improving the amino acid content and fitting it more closely to human needs.

"Our second objective is closely related: to improve our forage species in terms of quality and quantity so that the new varieties can make us less dependent on grainfed animals in stockyards in the production of meat and milk. This is going to reduce costs and free grain for human consumption.

"The IDRC has a program in Torreon, Mexico, which aims to reduce milk production costs by half by using pastures instead of by feeding animals in yards. And the last figures I heard from there indicated that rather than reducing them by half, the cost had been reduced by two-thirds. And this is but one example of something that could be repeated many times over throughout the world."

Finally, Dr Walton said, plant breeders can develop crop varieties with improved cold and drought tolerance and the ability to grow under acid and saline conditions in order to expand areas available



Threshing rice in Panay Island, Philippines. As much as one-quarter to one-third of the crop may be lost as a result of inefficiencies in handling and processing the crop after it has been harvested.

for production. "This kind of task is one that is very familiar to Canadian plant breeders, because in many ways the whole history of agriculture in Canada is that of moving ever further northward into more difficult environments. And this has often been achieved by plant breeding methods."

Dante de Padua, an agricultural engineer from the Philippines, proposed that food supplies in Asia could be increased by improving postharvest practices and thus cutting down on waste. Some estimates suggest that as much as one-quarter to one-third of a total food crop may be lost in less developed countries as a result of inefficiencies in the postharvest system. (The postharvest system can be described as all the components of the industry that deals with food crops from the time they are ready for harvest until they reach the consumer's table.)

The major mistake that has been made in the past in trying to improve postharvest practices in Asia has been to assume that industrial-type hardware, of the scale used in developed countries in temperate climates and designed for crops like wheat or corn, would work just as well in hot humid countries for rice, Dr de Padua said.

"The requirements in the Asian region are unique and complex in a way that makes the introduction of innovations and of the necessary hardware a much more difficult undertaking than it has generally been thought", he said. Postharvest technology requires considerable adaptation for application in Asia, and the hardware must make use of indigenous resources as much as possible.

He described several simple, inexpensive grain dryers that are being developed in Asia to cope with the area's special problems. One, made of 3/4-inch plywood and a simple fan, was designed by the University of the Philippines at Los Banos, where Dr de Padua works on the Southeast Asia Postharvest Program. Thailand's Royal Ministry of Agriculture has developed its own version of this dryer with a grant from the IDRC, and it has been exported to Malaysia and Indonesia under an Australian-ASEAN (Association of Southeast Asian Nations) program for introduction on farms. A massive extension-type demonstration and training course is being conducted to instruct ASEAN country farmers in the dryer's use.

One reason these dryers are needed is that commercial machines are simply out of the question because they are too expensive: "An installed three-ton-per-hour dryer from Denmark costs US\$288,000", Dr de Padua said. "An installed two-ton-per-hour Japanese rice mill costs about \$200,000."

The new, high yielding varieties of rice have made possible a second crop, which is harvested during the rainy months of September to November. The wet straw clogs harvesting machines, and if the rice is not dried it soon suffers from fermentation, mold, rot, or sprouting.

Many rice millers who traditionally have depended on sun-dried crops will simply stop purchasing during bad weather because they do not get a good enough price for wet rice, and this leaves the farmers without a market for it.

The antiquated milling system also contributes to rice yields lower than is possible in Southeast Asia, Dr de Padua said. Rubber-roller huskers are far more efficient than conventional disks coated with emery, but the rollers wear out quickly and are expensive. Dr de Padua said the replacement cost could be reduced by licensing local manufacturers to produce them.

Much of the discussion during the first of two panels centred on the need to concentrate efforts on helping the small farmer to increase food production, as these farmers comprise the vast majority of the population in developing countries and generally subsist on their own produce. Coupled with this was the need to avoid producing unwanted cultural effects by the changes introduced into traditional agricultural societies.

Most panelists seemed to agree that technical developments are necessary to solve the food problem, but, as Howard Steppler, chairman of the plant science department at McGill University put it, "How can we assure that technical developments do more good than harm?"

Jose Valle-Riestra, a program officer in the Centre's agriculture, food and nutrition sciences division at the Latin American regional office in Bogota said: "New technical developments are like antibiotics. They save a lot of lives but they have side effects." For example, he noted that new rice varieties have been so efficient in irrigated areas of Colombia that they have put upland rice growers out of business. Upland farmers simply cannot compete with growers in the irrigated areas. Such side effects are a consequence of forgetting the needs of the small farmers and concentrating on productivity: those working in development must respond to small farmers' needs, Dr Valle-Riestra said.

A member of the audience (who did not identify himself) raised a question often heard: Why insist on using agricultural chemicals in the Third World, and why all the emphasis on efficiency? Hadn't small farmers survived for centuries by using their own technology?

The panel's chairman, Dr C. Fred Bently, professor of soil science at the University of Alberta and one of the Centre's first governors, replied that an increase in food production is necessary if we aspire to some improvement in the human condition. Dr Steppler noted that, by coincidence, he had received a letter the previous day from Colombia, which gave the following results on the farms of *campesinos*:

- using the *campesinos*' own technology and local strains of cassava, their yield was two tons per hectare;
- using their technology and improved strains of cassava, the yield was five

tons per hectare; but

- using improved technology and improved strains of cassava the yield was 15 tons per hectare.

Both later explained that there were many reasons why agricultural chemicals and improved technology were needed on small farms in the Third World today. In former times, farmers did not have to feed the enormous present-day populations of the cities, only themselves. They and their families lived on their land in what constituted a closed system: they did not ship food beyond their land's borders, and their own wastes remained on their land. When the land's fertility was exhausted, they moved somewhere else.

Once it became necessary to grow large amounts of food for populations in the cities who no longer grow their own food, farmers had to take more nutrients out of the soil than they put into it. The lost nutrients subsequently had to be replaced by chemicals.

Dr Bentley said some Third World soils are so low in phosphorous that there are eight pounds or less in a single acre to a depth of one foot. Yet more than eight pounds of phosphorous are required to produce simply the grain in a 50-bushel crop, leaving aside the amounts required for the straw and roots. Thus if three successive crops were grown on such soil, all the phosphorous would be removed to a depth of three feet (the normal depth of crop roots). There is no way that the yield could be increased on such land under those conditions without adding phosphorous — actually, the yield would decrease over time.

The first panel discussion centred on the question, "Do technical developments in agriculture do more harm than good to the small farmers?" Although the panelists found it difficult to answer this in a categorical fashion, a remark by Dr Steppler perhaps expressed the opinion of the majority.

"There is an implication in the question that there is a 'yes' or 'no' answer and that we can live with either", Dr Steppler said. "The question we *should* address is, 'Do we need technical development to solve the world food problem?' — and the answer to that is an unqualified 'yes' ". □

China revisited: a personal view

Yue-man Yeung

Yue-man Yeung, Senior Program Officer with IDRC's Social Sciences Division based in Singapore, visited Kwangtung Province, People's Republic of China, earlier this year. His visit included four cities — Canton, Chao-ch'ing, Fo-shan and Ts'ung-hua — factories, a hydroelectric plant, a people's commune, homes, and wide stretches of China's countryside. In this article he gives us his impressions of China as it compares to his memories of it prior to the 1949 Revolution.

The Canton of 1944 I remember from my boyhood days was probably similar to most other coastal Chinese cities under Japanese occupation. The military presence was keenly felt and shortages of goods and services were acute. The streets, often littered with uncollected garbage, teemed with beggars and other destitutes scrounging for food and ways to keep alive. Canton's most impressive landmark then was the bridge over Pearl River, which was later blown up prior to the retreat of the Nationalist Government in 1950.

Today Canton looks highly orderly and organized. Imposing new structures such as the expansive Canton Trade Fair, the railway station, public parks, and new bridges across the Pearl River have been built. Although the common shophouses and residential precincts are much the same as I remembered them, the relatively uniform cityscape is occasionally punctuated by highrise hotels. Downtown Canton abounds with shops, department stores, and people. Bicycles are everywhere, even though Canton is served by an efficient electrical trolley bus system.

Signs of urban encroachment, however, are obvious in the suburbs where built-up areas surround garden plots. The streets and homes are poorly lit, a probable consequence of the priority accorded to the burgeoning industries.

After three decades of continual political education and campaigns, the people appear to be highly politicized:

everywhere people spoke to us with enthusiasm about nation building and seemed dedicated to achieving production targets. Two years after his death, Mao's presence is still pervasive — his likeness and quotations are found in every public place, factory, commune, and home. However, Mao's portrait is paired with Chairman Hua's and the slogans often link the ideas of both.

Under their leadership, China has attempted to reduce the differences between physical labour and mental work, the proletariat and farmers, the city and the countryside. At every briefing we were given, the cadres were emphatic about the four goals of modernization that China aspired to reach by the end of this century: to rank with the developed countries in industrialization, agriculture, defense, and science and technology.

These stated goals of modernization are indicative of the Chinese leaders' keen awareness that China lags behind the developed countries in many fields. For all the achievements brought about since the 1949 Revolution, China remains a relatively underdeveloped country. In the cities visited and the countryside passed, evidence was readily available that the old and the new go hand in hand. Rototillers are used in the same paddy field as ox-drawn plows, and imported Toyotas and Datsuns share the same road with human-drawn carts.

It would be unfair to compare China's level of development with the developed countries using the usual yardsticks of measurement. For one thing, China is run according to a social and political system stressing the principle of self-reliance.

From the information I obtained, goods are expensive relative to wages. For example, while a worker earns on average 40 to 60 yuan (approximately US\$24-\$36, 1 yuan is equivalent to about US\$0.60) a month, they must pay 130-175 yuan for a bicycle. The price range of some basic goods and services gives a good illustration of the cost of living: a bar of soap costs 1-1.5 yuan, a wrist watch, 270-320 yuan, a toothbrush, 0.5 yuan. These prices were about the same in different cities.

It is thus not surprising that few household goods, beyond the barest essentials, are found in homes. Despite its relatively high price, however, the bicycle seems to be an item in which many households readily invest. I was told that every working adult owns a bicycle and many households possess several, depending on the number of individuals at work.

On the other hand, the usual items of family expenditures do not cost much in China. Education, for instance, is heavily subsidized by the state. Piped water costs the equivalent of only 15 cents per person per month, and electricity, 1 cent per watt per month, calculated according to the drawing power of the lighting unit, not the cumulative number of watts used. Housing is also subsidized by the state or the employer, and an employee usually



Photo: Yue-man Yeung

Water conservancy projects, integrating irrigation and hydroelectric power generation have brought a measure of prosperity to once devastated lands in Kwangtung Province, China.

pays no more than 5 *yuan* a month for his living quarters. Our guide, for instance, informed us that for a space of 200 square feet, exclusive of the kitchen and toilet, he paid 2.4 *yuan* in Canton. He estimated that the monthly cost of living for a person would be no more than 15 *yuan*. Women are actively encouraged to participate in the labour force. To relieve them from child-rearing and household responsibilities, nurseries and daycare centres are available in cities and villages.

Housing, especially in the urban area, is carefully controlled. No individual or family is allocated housing unless they have found work in the city. Linking housing to work and the administrative order is an effective instrument in regulating rural-urban migration. This, complemented by a rationing system extending to the key commodities — grains, cotton, edible oil, etc. — has been used to effect a predetermined, planned pattern of population distribution. China is thus spared of the many thorny problems that other developing countries still face in the persistent cityward migration. In fact, China has been able to implement a reverse flow of population by dispersing intellectuals and highschool graduates from the urban to rural areas in a movement called *hsia fang*. Thus, for two to three years, they participate in agricultural production.

If the urban development has not been spectacular, I was much impressed with the reconstruction of the rural areas. There were signs everywhere of effective control and utilization of water resources, high yields through heavy use of improved seeds, and electrification and expansion of the rural industries — the three lines considered crucial in the development of people's communes. I was also impressed by the general orderliness and the industry with which farmers worked in this part of the "ricebowl" south. A wide variety of crops, grains, and fruit trees are grown using traditional and modern techniques. Pesticides are regularly sprayed and, unlike the pre-1949 period, a minimum of boundaries demarcate the fields. Arable land has been consolidated and even cemeteries have been removed to give maximum acreage to farming. It is significant that where cemeteries used to occupy two percent of the total land in China prior to 1949, we only saw two — specifically preserved for Muslims — during our trip, and they were in Canton and its suburb.

Water conservancy, integrating irrigation and the generation of hydroelectricity, has been emphasized in China since 1949. Our guide was quick to point out that many parts of the countryside now covered with crops and fruit trees were once badly affected by gully erosion and deforestation. To gain an idea of a water conservancy scheme, we visited the hydroelectric plant at Liu Hsi River, the first of such plants to be completed in Kwangtung in 1958. Built over a period of two years, the plant can irrigate an area of 500,000 *mou*, or about 82,500 acres.

With a capacity of 42,000 kW, the scheme has been able to supply electricity and water to a wide area that previously lacked electricity and was affected by periodic droughts and devastating floods.



Photo: Clyde Sanger

The group also visited Kuan Ts'un People's Commune in Ts'ung-hua Hsien. With a population of 14,000, the commune is made up of eight production brigades divided into 69 production teams. In a talk to our group, the cadre-in-charge emphasized the mass line approach along which the commune is organized. The production pattern, work distribution, and rewards system are all group organized. But although the tools such as tractors and buffaloes are owned by the commune, housing, furniture, small farming tools, and family savings are individually owned. Each person is credited according to a point system for which he or she is rewarded at the end of a year: apparently, a working adult can earn about 300 *yuan*. The cadre pointed out the very significant improvements that have been made since 1949, when the area was without electricity, medical facilities, irrigation, or communication connections. All these have now been vastly improved and, since 1965, the commune has generated its own electricity. The productivity of the farming sector has increased by leaps and bounds. While it produced 200 *kati* (1 *kati* equals 1.33 lbs) of rice per *mou* in 1949, it produced 1200 *kati* in 1977. The same increases have been realized in many other lines of production. The commune has a total of 32 factories, 10,000 chickens, 10 pumping stations, 4 primary schools, and a hospital. It was claimed that 80 percent of agricultural production is mechanized. One-third of the rice produced is exported to the city and 80 percent of the fruits are also consumed outside the commune. There has been no problem of an exodus of the young people, as labour movement is regulated and controlled.

Villagers contribute 10 cents a month to a medical scheme, and pay another 10 cents for each consultation. The hospital, with 28 beds and facilities in gynecology, dental surgery, X-ray, and general surgery, produces its own medicine by assembling and processing herbs gathered in the area.

While traveling through the countryside, I noticed markets at several locations that were quite well patronized. Interestingly, marketing in rural Kwangtung is periodic. Markets are held on the first and sixth days of every cycle of the month (in China the months all number 30 days and are divided into 3 cycles of 10 days each). In other words, these fairs are held six days a month to allow individuals to dispose of surplus produce from their private plots. I was led to understand that before 1949 the fairs in rural Kwangtung were highly disorganized. One clan might run markets on certain days, while other villages would hold theirs on other days, which resulted in a great loss of productive work. Consequently, the markets have been reorganized to run synchronously six days in a month.

According to frequent visitors in our group, life in China has become more relaxed since the downfall of the "Gang of Four". People are now more willing to speak up, and the general atmosphere, with the emphasis on economic production and clearly set production targets, is one of cautious optimism. Under these improved conditions, cultural life has begun to flourish again. The performance of a Cantonese opera we attended in Canton was superior to what can presently be seen in Hong Kong. It was interesting to note that the artists and musicians were relatively young, and that this art is highly popular with the local people.

From my casual observation of the agricultural development and progress in Kwangtung, I am almost certain that there is much that the developing countries can learn from China's massive experiment in rural reconstruction and development. The evidence suggests that the Chinese are increasingly scientific in their endeavor to upgrade their agricultural production, whether it be food or cash crops, fishery or forestry.

China is as rigid and egalitarian a society as one can expect. People appear to be fully employed both in the countryside and in the cities, inflation is kept in check, the extreme poverty of earlier days has been eliminated. People at every level appear to be united and dedicated to nation building. These are no mean accomplishments for a nation that over the past two centuries has been continually ravished by natural disasters, external aggression, and civil war. In a land where famine used to stalk, people appear to be adequately fed and clothed.

These are the fruits of a monumental experiment that truly revolutionized the most populous country in the world. For many years, China observers were concerned about the transitional problem resulting from the death of Chairman Mao. My observations are that post-Mao China is as dedicated and full of purpose as ever. China after Mao seems well poised for another phase of constructive nation building.

□

BRIEFS

CANADA LOSING GROUND

Canadians are faced with the virtual deindustrialization of an economy that seemed to have had "everything going for it" since the Second World War. And indeed, Canada is in danger of becoming a kind of pre-industrial society that is unable to satisfy the economic aspirations of its citizens. These are the suggestions contained in a recent study prepared by the Science Council of Canada, entitled *The weakest link: a technological perspective on Canadian industrial underdevelopment*.

The study points to one reason for this "alarming situation" as the Canadian failure to exploit the opportunities of the recent economic growth of the last 25 years to generate real industrial development, or establish a positive and growing role for technological and innovative manufacturing.

Foreign manufactured goods are increasingly penetrating the domestic Canadian market: mature conventional goods from developing or newly industrializing countries, and high-technology goods from the advanced countries. Canada, unlike most developed economies, is a major importer of professional, technical, and managerial services. This only makes matters worse, according to the study.

Many of the problems lie with our industrial structure. Industrial development in the more developed countries is now "marked by a growing interdependence between industrial and scientific competence". Science and technology are being systematically applied to the development of new and more efficient industrial processes, production, and managerial systems. This is the 'third wave' of industrial development, which the study says is "washing over Canada rather than propelling it forward".

The weakest link attributes Canada's industrial malaise to the behaviour of firms in the country, and specifically identifies the way that foreign firms have been allowed to operate as one of the most important agents of this malaise. Most of the larger firms in Canada are foreign controlled, and as a result are frequently technologically dependent or imitative, lacking in innovative capability. Most of the smaller firms are domestically controlled, but technologically unprogressive. Canada is too dependent on the production of conventional prod-

ucts, which "will increasingly be the preserve of the newly industrializing countries".

The only way that firms in Canada will hold their own in domestic markets and establish industrial positions as successful exporters is to foster innovation in order to produce new product and process developments. The study states that Canada "urgently requires a comprehensive industrial strategy to facilitate the growth of competitive (not merely more efficient) firms", and that technology development policy must be central to this strategy.

EACH ONE TEACH SOME

The United Nations General Assembly has proclaimed 1979 as the International Year of the Child. Part of the activities of the special year is a child-to-child program, based on the idea that children can help each other.

Primary school students in Indonesia and the Philippines have been doing just that for the past 4 years, by teaching themselves and younger students the school curriculum. Project Impact, an experiment in the delivery of mass primary education, calls on older students to do programmed teaching, on high school students to act as tutors, and on the entire community to teach their skills. Students also work in small groups with peers at the same learning level, using simple booklets called modules that cover the year's course work in small steps. Available research evidence indicates that the Impact system is both more economical and more efficient than the conventional school system.



Now the students are ready to demonstrate the efficiency of Project Impact. The Regional Centre for Educational Innovation and Technology (Innotech), which is responsible for Project Impact, has designated the school year 1978-79 Impact Demonstration Year. Visitors and observers will be wel-

come at the three project sites in the Philippines — Naga in Cebu, Lapu-Lapu City, and Sapang Palay in San Jose del Monte, Bulacan — and at Proyek Pamanong in Solo, Indonesia.

Requests for visits to any of the Impact sites in the Philippines should be made to The Director, Innotech, College of Education Building, University of the Philippines Diliman, Quezon City, Philippines; and in Indonesia, to The Chairman of BP3K, Department of Education and Culture, Jalan Jenderal Sudirman, Senayan, Jakarta, Indonesia.

POVERTY TRAP TIGHTENS

Six hundred million people will remain trapped in absolute poverty by the end of the century, despite unprecedented world economic growth over the last 25 years. This was the "most shocking conclusion" of a World Bank study, *World Development Report*, and the theme of an address by its President Robert S. McNamara to the joint annual meeting of that organization and the International Monetary Fund.

Even this "intolerable" figure was based on optimistic projections of economic growth rates in the developing countries, and assumed an expansion in international trade and of commercial and concessional finance, "prospects which are far from certain". These people face "a condition of life so characterized by malnutrition, illiteracy, disease, high infant mortality and low life expectancy as to be beneath any reasonable definition of human decency", said Mr McNamara.

He called for three types of action at the international level to attack the problem of poverty, and stimulate economic growth and distribute its benefits more widely. International trade should be expanded further on the basis of "long-term comparative advantage and mutual benefit". Secondly, the flow of capital to the middle-income developing countries needs to be sharply increased, with increased support from the multilateral financial institutions. Thirdly, the flow of concessional assistance to the poorest developing countries has to be increased.

The developing countries in their turn must place greater emphasis on domestic plans to reduce absolute poverty. The poor must be assisted in becoming more productive themselves. "Clearly what will not work is mere traditional welfare, redistribution of an already inadequate national income."

A key factor in the acceleration of economic growth in developing countries is the expansion of exports, especially manufactured

goods, to the developed countries. This will not be possible if the developed countries continue to erect protectionist trade barriers against these goods, fearing losses of income and employment. In fact, Mr McNamara says, the number of workers displaced by imports from developing countries was only a fraction of those displaced from internal shifts in technology and market demand. He pointed out that the loss of jobs in some sectors was offset by the overall increase in jobs due to a growing volume of exports to these same developing countries.

Touching on the flows of Official Development Assistance (ODA), to the low-income developing countries, Mr McNamara said that recent trends had been disquieting. As a proportion of GNP, the flow of assistance from the main donor countries had declined from 0.52 percent in 1960, to 0.31 percent in 1977. Among the four largest contributors, only France was close to the 0.7 percent objective of 1977. The other three, the United States, Japan, and Germany, all contributed substantially less than half the target ratio. Canada's official development assistance flow was 0.51 percent of our GNP for 1977.

NEW DIRECTORS APPOINTED

Two new Centre officers have been appointed by the IDRC Board of Governors. They are Reginald MacIntyre, Director of the Communications Division (formerly Publications Division), and David Steedman, Director of the Social Sciences Division.

Reginald MacIntyre has been an active member of the Canadian federal government's information community since 1956. He joined IDRC in 1972, becoming Associate Director of the Publications Division in 1977, and Acting Director in 1978 on the resignation of Ernest Corea. The Communications Division is a restructuring of the former Publications Division, reflecting the changing scope and direction of information activities.

David Steedman, a distinguished Canadian academic, replaces Ruth K. Zagorin as Director of the Social Sciences Division. Dr Steedman was a Woodrow Wilson Fellow at Yale, where he completed his doctorate in French literature. He has held a number of academic and administrative positions at universities in Canada and the USA, and has chaired or sat on committees dealing with policies and programs of research in the university community. He was most recently Academic Director of the Canadian Federation for the Humanities.

Viewpoint

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada, K1G 3H9.

I was very interested to read the article "Vietnam fights a different war" (*Reports*, Vol. 7 No. 3). However, I do not agree with the comments on the prevention and treatment of tuberculosis. The information given about BCG was incorrect. Regular freeze-dried vaccine was widely used in the country. Some of this was produced at the Pasteur Institute, Saigon, and a considerable quantity of Connaught freeze-dried vaccine was supplied from Canada.

On the matter of the treatment of tuberculosis, dihydro-streptomycin was used at one period in Vietnam and it did produce problems with deafness and loss of balance, which are both functions of the 8th auditory nerve. However, as these complications became apparent, the system of treatment was changed. The use of dihydro-streptomycin was discontinued and streptomycin was substituted, and used for 12 weeks only, usually twice weekly. This eliminated the problem of deafness and imbalance.

The suggestion that placental extracts were effective in treating tuberculosis is absolute nonsense. The very effective treatment of tuberculosis used everywhere in South Vietnam included streptomycin, isoniazid, thiacetazone and para-amino salicylic acid (PAS).

I took the photograph of the little girl with her baby brother on her back at the Quang Ngai railway station in South Vietnam in 1968. I was working there on the CIDA tuberculosis program. The trains had long since ceased to run, all the bridges having been wrecked by the war. The railway engine in the background of the picture was the home in which she lived.

I revisited the area in 1969 and took a copy of the picture with me but very sadly found that she and her family had been killed. What a tragedy of war....

C.W.L. Jeanes, MD
Chief, Health and Population
Resources Branch
Canadian International Development Agency (CIDA)

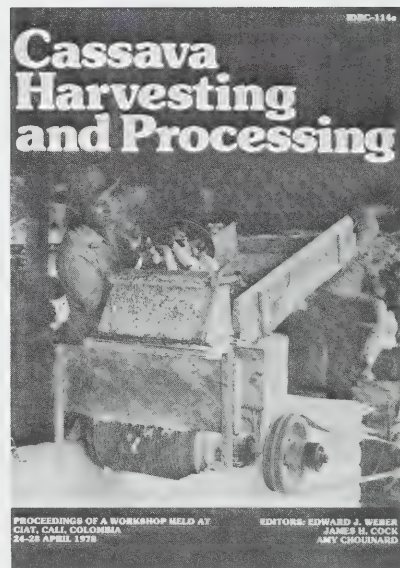
I suggest that David Spurgeon in his article on traditional medicine (*Reports* Vol. 7 No. 2) is not quite right when he says that the Zaire program "is the first national research program on traditional medicine in an African country". This statement tends to suggest that not much is going on elsewhere: however, a list compiled by ENDA (Environment and Development in Africa) of organizations working in this field — and which is certainly incomplete — gives 70 institutions in Africa, without counting those specifically concentrating on mental health care. Moreover, if it really is important to talk about "firsts", due mention should be made of the program in Ghana: the Centre for Scientific Research in Plant Medicine was founded by the government in 1973, under the leadership of Dr Ampofo who had since 1962, together with Dr A.N. Tachie, started research at the request of Kwame Nkrumah.

What, however, does seem particularly interesting in the Zaire project is that it aims at an understanding of health care and medical practice as much as of medical products, and one might suggest that many research programs are weak in this respect, some of them being frankly very sceptical of traditional medical care and only interested in integrating new medical products of plant origin into "modern" medical practice.

Philip Langley,
ENDA Environment Training Programme,
Dakar, Senegal

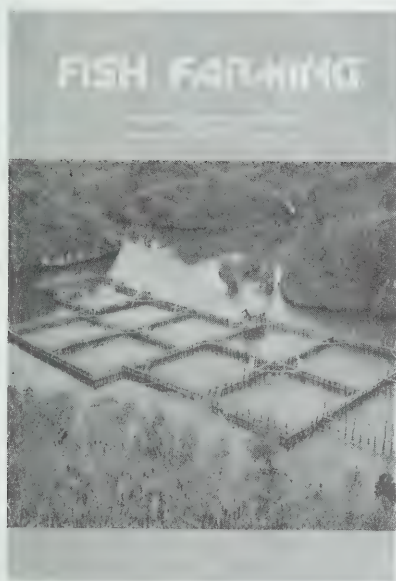
New publications and films

Publications



Cassava harvesting and processing, Edward J. Weber, James H. Cock, and Amy Chouinard, editors. Published in November 1978, 84 pages, IDRC-114e.

This is the report of a workshop co-sponsored by IDRC and the International Centre for Tropical Agriculture (CIAT), in Cali, Columbia, 24-28 April 1978. Twelfth in a series of publications on the development and utilization of cassava, this report discusses cassava processing for feed production, drying and chipping, starch extraction, use of cassava flour in food preparation, and cassava fermentation for fuel alcohol production. The publication contains summaries of papers presented at the workshop and of discussions, as well as a list of participants.



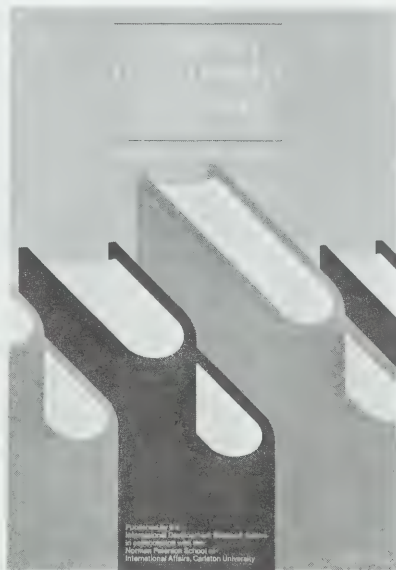
Fish farming: an account of the aquaculture research program supported by the International Development Research Centre, Bob Stanley, W.H. Allsopp, and F. Brian Davy. Published in November 1978, 40 pages, IDRC-120e
An account of the aquaculture research projects supported by the IDRC, this publication is the basis of the article *Harvesting the waters* which appears on page 3 of this issue of *IDRC Reports*.

Searching - Report on the activities of IDRC 1978. Published in January 1979, 33 pages, IDRC-110e.

A non-technical review of the work of the IDRC during 1978, this publication puts in perspective for the general reader some of the areas of the Centre's support for development research. Highlighted are forestry and aquaculture programs, the delivery of health care to rural populations, water and sanitation, regional and international information systems, science policy and technology transfer, and innovative educational systems. The review also contains a breakdown of funding and a list of new publications. (Also available in French and Spanish.)

Biological synopsis of the manatee, K. Ronald, L.J. Selley, and E.C. Amoroso. Published in November 1978, 112 pages, IDRC-TS13e.

This publication brings together all known material on the manatee, a tropical aquatic mammal that has potential for aquatic weed control and as a source of protein for human consumption. Information is provided on the manatee's anatomy, structure, function, environment, distribution, management, and conservation, together with an extensive bibliography. The authors point out that little new information on the manatee has been made available since the nineteenth century, and hope that this volume will provide incentive and directions for future research.



Canadian development assistance: a selected bibliography 1950-77, Shirley B. Seward and Helen Janssen. Published in November 1978, 62 pages, IDRC-113e.
A joint publication of IDRC and the Norman Paterson School of International Affairs, Carleton University, Ottawa, this bibliography covers Canada's foreign aid programs and policies from 1950 to 1970. Divided in four sections, it traces the history of Canada's international assistance programs, policies, and issues, including strategies developed by CIDA (Canadian International Development Agency); outlines regional aid programs in Asia, the Caribbean, Commonwealth Africa, francophone Africa, and Latin America; lists Government and official publications; and compiles the main bibliographies and reference works directly relevant to Canadian foreign policy and development cooperation.

Films

Pods of protein, produced by IDRC in cooperation with the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. Filmed and produced by Neill McKee, 16mm, colour, 20 minutes, released in January 1979.

Describing the international cowpea improvement program based at IITA, the film focusses on this food legume, which has been cultivated in West Africa for some 4000 years and which provides as much as 60 percent of the human protein intake in some countries. It describes the problems of developing the full potential of cowpeas as well as the aims of the IITA research program, and uses an IDRC-supported cooperative cowpea program in Upper Volta to illustrate the work undertaken. The film is intended for policy-makers and those concerned with instituting or managing national crop improvement programs, and will also interest educational and research institutes.

Tropical oysterculture. Filmed and produced by Neill McKee, 16mm, colour, 30 minutes, released in January 1979.

This instructional film describes the tropical oyster, its biology, and the technologies used for its cultivation as a food crop. Based on experimental oysterculture projects supported by IDRC in Sierra Leone and Malaysia, the film shows how the vast areas of mangrove forest in tropical countries could be used to produce this high protein food. The film is intended for fisheries research organizations, educational institutes and others concerned with aquaculture and the management of ocean resources for food production.

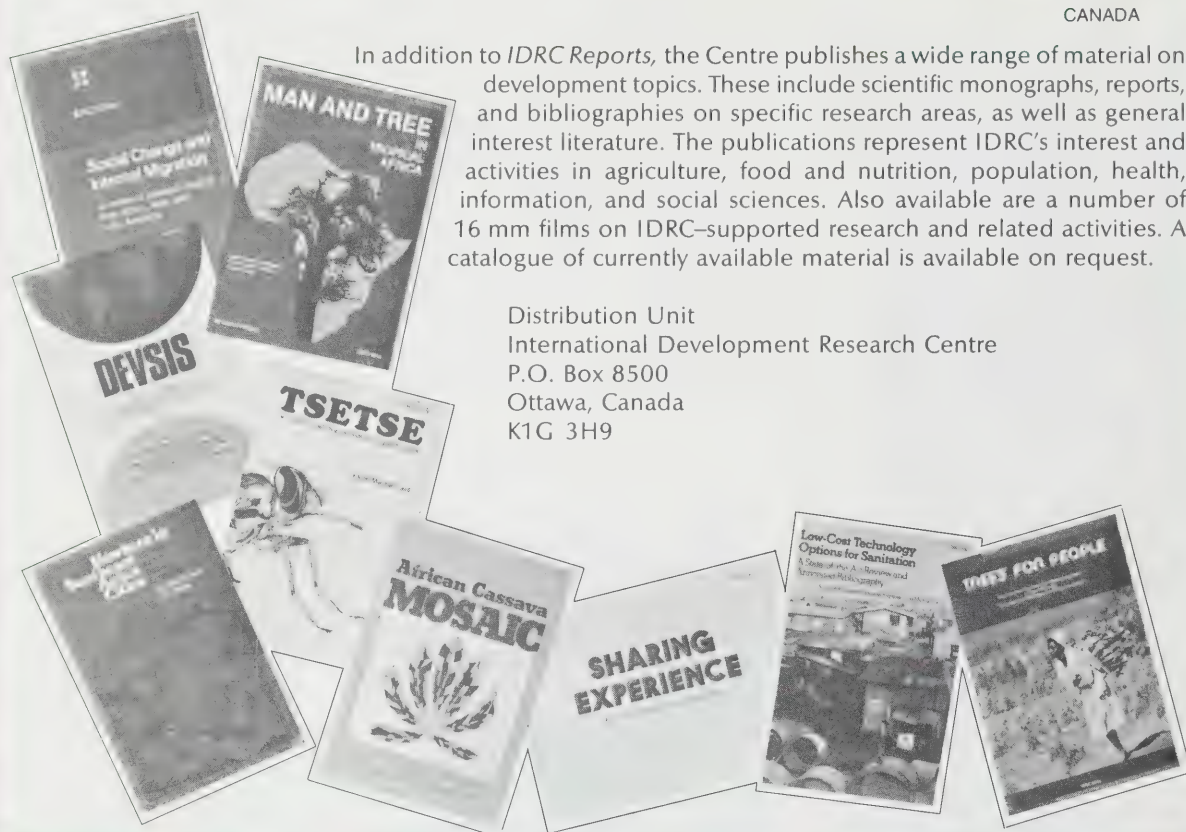
For information on these and other IDRC publications, see announcement on the back cover of this issue.

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related activities. A catalogue of currently available material is available on request.

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DOSSIER:
DEVELOPMENT FOR CHILDREN

Cover photo: Neill McKee. In a makeshift playpen, in a Kuala Lumpur market, a little girl waits. Too many of the world's children are also waiting — for health care, for enough to eat, for an opportunity to attend school, for a better future. See Dossier: development for children, beginning on page 11.



The IDRC Reports, and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division.

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Contents

3 Tropical diseases: on the road to success

Alexander Dorozynski reports on the progress of a renewed attack on tropical disease.

6 Upper Volta — population on the move

Young people in Upper Volta are seeking greener pastures, but often return without even the benefit of experience, as Jean-Marc Fleury reveals.

8 Tight nets cast for African cattle killers

The tsetse fly, vector of trypanosomiasis, presents a stubborn, crippling problem. Rowan Shirkie outlines some of the causes of the problem and the search for solutions.

11 Dossier: development for children

The United Nations has declared 1979 the International Year of the Child. But improving the lives of children cannot be separated from overall development efforts. This dossier examines some areas of IDRC's participation in development projects that may ensure children of a better future.

19 Science news that's fit to print

"Science news has a place in Asian newspapers, but does it have a market?" asks Rowan Shirkie.

20 Countdown to UNCTSD

Preparations for the upcoming UN Conference on Science and Technology for Development are gaining momentum. Jean-Marc Fleury looks at some of the issues.

23 Viewpoint

Readers' views on IDRC Reports articles.

24 Briefs

People, projects, events

25 Commentary

Dr Kenneth King calls for a more rational, people-oriented approach to land use.

27 New publications

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Tropical diseases

On the road to success

Alexander Dorozynski

In April last year, six medical researchers from several parts of Asia and Latin America met at the World Health Organization (WHO) Malaria Training Centre in Prabudhapat, a small town in rural Thailand. They were joined there by Dr Karl B. Rieckmann, a well-known parasitologist at the University of New Mexico in Albuquerque, USA.

For two weeks, in a library turned laboratory and sporadically isolated from the humid hot weather by a reluctant airconditioner, the researchers poured over hundreds of microscope slides with blood samples taken from malaria patients in the region and incubated with different anti-malarial drugs. On the door of the library, someone had posted a sign: "On the road to success".

The purpose of the gathering was to assess a new technique developed by Dr Rieckmann for measuring the susceptibility of malaria parasites to drugs. Such measurement must be an essential part of the effort to control malaria as it helps identify those strains of the *Plasmodium* parasite that have become resistant to chloroquine, hitherto the standard and most effective treatment. Resistance of the parasite to chloroquine and related drugs has been reported in 20 countries, including Thailand.

Until now, the only method for identifying those mutant parasites with certainty required the use of several cc of blood drawn from a patient's vein, a method that required experienced personnel to collect the samples and one that could not be practiced routinely on young children because of the large amount of blood required. But three months earlier, in January 1978, Dr Rieckmann had published the description of a new technique based on the microscope study of a single drop of blood from a finger prick. This *in vitro* micro-technique, if it turned out to be reliable and practicable on a large scale, could represent a major contribution to the diagnosis of drug-resistant malaria and possibly also to the screening of new drugs.

The assessment of such a method could have taken months, even years. The organization of the WHO Special Programme for Research and Training in Tropical Diseases made it possible, however, to reduce this lead time to a few weeks. In fact, in two weeks of intensive work — often carried on late into the evening — the team showed that a single drop of blood, maintained in an appropriate medium to which varying concentrations of drugs were added, made it possible to identify drug resistant parasites with as much reliability as the earlier, more cumbersome technique.

The results were encouraging but still inconclusive. In the months that followed, the researchers continued testing the technique in endemic regions of Asia and Latin America, and trained other researchers in its use. By August of 1976 (five months after the meeting in Thailand), courses in parasite sensitivity had been given in Brazil, Colombia, El Salvador, Sudan, Bangladesh, India, and Sri Lanka, and a test kit was being prepared for field testing.

At the same time as the researchers were working in Prabudhapat, another Special Programme activity was underway at Mahidol University in Bangkok. There, Professor William Trager of Rockefeller University was giving courses in another new technique that represents one of the few genuine breakthroughs to have occurred in the field of parasitology in the past few years: the continuous *in vitro* culture of malaria parasites.

The breakthrough came in 1976 when Prof. Trager succeeded in maintaining a laboratory culture of *Plasmodium falciparum*, the deadliest of the malaria parasites, for several months. In the months that followed, his method was tried with success by a number of parasitologists. For the first time, large quantities of the parasite could be made available for research purposes, opening the way to the development of a vaccine. The possibility of developing a vaccine is one of the greatest hopes of malaria research. Experiments on animals and a few trials on human volunteers have shown that at least a partial immunity against the disease can be acquired.

Some 20 researchers, most of them from Asian countries, availed themselves of Prof. Trager's visit. And taking advantage of this "international première", the university set up assorted courses in parasite genetics, assessment of drug resistance, and seminars on the typing of different strains of parasites with the help of WHO. The scientists who participated have since held a course for their colleagues. Meanwhile, Prof. Trager held a repeat performance at the University College of Ibadan, Nigeria.

This renewal of interest in malaria and other tropical diseases dates from 1975 or 1976 when the increasing



Photo: Marshall Laird

The cycle of transmission of river blindness, a filariasis, is depicted in this tapestry from Ivory Coast. Renewed research efforts are beginning to unravel the mystery of major tropical diseases.

burden of the diseases was recognized by many governments and international organizations, and when efforts at controlling them failed in many countries. The Special Programme for Research and Training in Tropical Diseases was established by WHO in order to coordinate the efforts of scientists throughout the world in an assault of modern science on areas barely touched on in the past.

The Special Programme represents the first concerted attempt to achieve global scientific, social, and administrative cooperation towards the ultimate goal of controlling the major tropical diseases that affect hundreds of millions of people in the world. And although the Programme's secretariat is small — less than 30 people — thousands are involved: scientists exploring new approaches to the understanding, prevention, and treatment of the diseases; teaching, research, and support staff carrying out specific projects; members of regional institutions; and government officials and administrators.

Since its inception in 1976, the Programme has evolved rapidly, fuelled by the enthusiastic support of the international scientific and medical community, by governments and government agencies, and by adequate financing. From the start, WHO has been a pivot point of the program, which was organized with the help of the United Nations Development Programme (UNDP), IDRC, and Sweden. A total of \$7.5 million was pledged for pilot activities in 1977, and voluntary contributions allowed the budget for that year to grow to \$11.5 million. In 1978, the budget approached \$20 million, representing the support of some 26 governments and organizations. The World Bank that year became the third cosponsor, acting as financial manager and agent, and contributing its expertise.

It is the scientists, however, who select research priorities, outline the strategy, do the research, and evaluate the results. The Programme's director, Dr Adetokinbo O. Lucas, former Chairman of the Nigerian Medical Council, is himself a scientist. Research is planned and implemented by Scientific Working Groups (SWGs) made up of scientists selected on a worldwide basis. By the beginning of 1978, a dozen working groups had been formed to follow the major paths of research, from the immunology of malaria, to biological control of disease vectors.

The Scientific Working Groups are in constant liaison with a Scientific and Technical Advisory Committee of 15–18 scientists appointed by WHO to serve for three years. This committee reviews the progress of the Special Programme, recommends priorities, examines the balance of activities, and provides the sponsors with a continuous evaluation. A joint coordinating board made up of 30 members

from the supporting countries and those directly affected ensures liaison.

The Special Programme may be of a limited duration. It will not in itself solve the problems posed by tropical diseases deeply entrenched in many regions of the world. It must, however, promote national commitment, the establishment of research and training institutions, and the career and salary structures needed for the support of scientific capabilities over the long term.

To this end, a Research Strengthening Group has been set up to effect a mutually beneficial union of modern science and research in the tropics. Organized as a SWG, it has initiated collaboration between institutions in the developing and developed world, and between institutions within the developing countries, in order to promote a scientific approach to problem solving and the mastery of the needed technology.

The Programme can contribute the backing of top international scientists and financial support. Institutions and scientists from industrialized countries may help train researchers from developing countries. Institutions in developing countries may also be strengthened in certain areas. For instance, a training course leading to a master's degree in tropical diseases with emphasis on clinical aspects will be given at the University of Nairobi in Kenya. A proposal for the creation of a Centre for Research and Training in Clinical Pharmacology has been approved at the University of Ibadan, Nigeria, and the Institute for Medical Research in Kuala Lumpur, Malaysia, will be strengthened in tropical diseases.

Socioeconomic aspects of tropical diseases, long neglected, are an integral part of the Programme. In fact, it is recognized that biomedical and applied research must be accompanied by social science research geared to improving the application of existing technologies, and to preparing the way for the choice and the successful application of new ones.

Yet this is a practically uncharted field of inquiry. New analytical methods and approaches are needed to help prepare guidelines for a feasible policy of disease control that can be implemented with means available in developing countries. They can help in indicating what a country can do with a given budget, what are the best strategies to choose, what basic information is still missing, and what could be expected from other approaches.

Two Scientific Working Groups will be particularly concerned with the human and economic factors that play an important role in disease transmission. Both are expected to lead to the development of quantitative analytic techniques that should yield results useable in an "operational research" approach to be developed in parallel with new biomedical tools.

The first SWG to be set up focused on the immunology of leprosy, a disease that affects some 10 million people in the world. Considerable progress has been made, including the discovery that nine-banded armadillos thrive best on tinned cat food. This finding may seem insignificant to some, but not to the researchers.

The SWG had found that large amounts of the leprosy bacillus, *Mycobacterium leprae*, can be obtained by injecting



Researchers collect samples from the Monongo River in Ivory Coast in order to study the breeding ground and habitat of the blackfly, vector of river blindness.

Photo: M. O'Shaughnessy

the infective material into the armadillo. Previously, only small amounts could be gathered following injection into foot pads of mice. But a major problem to standardizing and increasing production was that the armadillos died before the bacillus could reproduce in large amounts. They died, not of infection, but of malnutrition because laboratory workers didn't quite know what diet the captive animals thrive on. Thus, the cat food finding became part of the picture of leprosy research.

The availability of large amounts of infective material enabled the members of the group to carry out experiments on mice and guinea pigs, and to show that in these animals *M. leprae* inoculum was indeed capable of eliciting long term protection against infection with live *M. leprae*. The results were confirmed by several laboratories and the study is now underway of different possible strategies for the development and testing of an actual leprosy vaccine.

In the meanwhile, the group concerned with the chemotherapy of leprosy has completed the task of designing several test protocols to study the treatment of leprosy with existing drugs. Trials are being carried out in four centres, two in India, one in Africa and one in the Soviet Union.

Finally, a new group is being formed to study the fundamental biology of the bacillus. It will attempt to establish cultures of the bacillus *in vitro*, and will utilize the most modern techniques of biomedical science, including genetic engineering.

Of the six diseases that are the target of the Special Programme, five are vector-borne: trypanosomiasis, malaria, filariasis, leishmaniasis, and schistosomiasis. In the case of trypanosomiasis or sleeping sickness, no vector control treatment or prevention measure exists that can eradicate the disease. At best, partial suppression can be achieved, and it requires relentless efforts. In the first half of this century, continuous medical surveillance programs gradually reduced the incidence of the disease, but in the 1960s it gained strength, particularly in Angola, Cameroon, the Sudan, and regions of Kenya.

One of the most important goals of the Special Programme is to provide assistance and guidance to improve surveillance. This is being done through leadership seminars to train and motivate medical assistants and veterinary assistants. The trypanosomiasis swg strives to improve the existing means of control to make their utilization simple and less costly. Several new diagnostic methods are being tested, notably an "instant flocculation test" requiring a single drop of blood to show the antigen-antibody reaction that means infection has taken place. Standardized treatment protocols using existing drugs are being developed

and new compounds tested. A few such compounds have been identified through research supported by the Programme, and additional screening and testing is carried out in cooperation with the pharmaceutical industry.

Interesting results have been achieved with a new low-volume method of spraying insecticides: the chemicals are broken down into tiny aerosol-like droplets and delivered from the air by helicopters, thus achieving a considerable saving of costly chemicals.

The Programme also supports empirical research of control agents and the screening of potentially useful new compounds, as well as fundamental research requiring the study of the metabolic processes of the trypanosome parasite, its relationship with the host, and the immunological processes involved.

Filariasis is also on the increase. This disease, or rather group of diseases (at least eight filarial parasites infect humans), is not well understood. People have different reactions to it, the relationship between the host's immune response to the invading parasite and the antigens of the parasite remains a puzzle. None of the parasites have been cultured in the laboratory, and only a few have been grown in animals. The picture is further complicated by the fact that the parasites go through different life stages.

Regular meetings of the Filariasis Scientific Working Group and Steering Committee have led to the identification of research priorities and a score of specific projects have been outlined.

Mosquitoes, flies, snails ... these are major vectors in tropical diseases, in-

dispensable links in the chain of transmission. Breaking the links would interrupt the cycle, but it has been shown that it is not possible within the foreseeable future. Vector control remains, nevertheless, an important weapon in the struggle, and biological control methods a promising avenue.

Now that pesticide costs are climbing ever higher, and many vectors have become resistant to major pesticides, researchers are desperately trying to find other means, notably bacteria and fungi, to attack the vectors. This approach is by no means new to the WHO, nor is it limited to the Special Programme. Since 1965, Ohio State University has been collaborating with WHO in conducting a global inventory of likely candidates and this effort has now been intensified.

Several promising agents have been identified, notably spore-forming bacteria. For example, in India a particular strain of the bacillus *Thuringensis* has been shown to be effective, at least in laboratory tests, against two species of mosquitoes. Viruses, insect-derived fungi, protozoa, and nematode worms are also promising candidates, but much work remains to be done before suitable ones are identified, and tested for safety in animals and other non-target organisms. All of this must take place before large-scale field trials are envisaged and before the means of delivery are studied.

The Special Programme for Research and Training in Tropical Diseases does not claim to be able to solve, within a foreseeable future, the health problems that are particular to the tropical regions of the world. But the fact that the Programme exists, that its activities are expanding, and that it is receiving increasing support from national governments and international agencies means that there is a global recognition of a problem that cannot be solved by the mere transfer of medical technology to the developing world.

The Programme's ambition is to become a tool that scientists can rely on to communicate and collaborate on a global scale towards easing the tremendous burden posed by tropical diseases. It may be said that the investment is relatively small in comparison to the dimensions of the problem. But there is an attempt to create a chain of transmission of knowledge with a multiplier effect. If this succeeds, every country will have its own qualified task force to deal with its own problems, as well as the backup of the international scientific community. □



Egypt's irrigation canals provide a bountiful harvest of snails, vectors of schistosomiasis (snail fever).

Alexander Dorozynski is a science writer specializing in medical topics and the author of a booklet on the Special Programme for Research and Training in Tropical Diseases, supported by IDRC and soon to be published by WHO. This article summarizes some of the points dealt with in the booklet.

Since the beginning of time man has been a wanderer, and his migrations have resulted in the population of entire continents. Every year, economic difficulties or political upheavals set hundreds of thousands — even millions — of people in movement. But these migrations are not simply a matter of chance: they are closely linked to a country's position in the world economic order.

Whether it be southern Europe for northern Europe; Puerto Rico and Mexico for the United States; Zambia, Mozambique, and Malawi for Rhodesia and South Africa, many countries act as labour pools for other more industrialized nations. In West Africa, the most striking example of population exchanges between countries is found in Upper Volta, which supplies tens of thousands of workers to the coffee and cocoa plantations of Ghana and the Ivory Coast. The contribution of migrants from Upper Volta to the economies of these two countries is so great that when Ghana forced foreign workers to leave in 1970, agricultural production, particularly that of cocoa, dropped markedly. The impact would probably be even greater in the Ivory Coast, where migrant workers represent about two-thirds of all agricultural wage earners.

Migrations are by no means new in Upper Volta: they occurred periodically even before the nineteenth century, mainly as a result of wars and famines. As plantations developed in the Ivory Coast following World War II, however, the massive migration of Upper Volta's young men from their country became a virtual tradition. Today Upper Volta's reputation as a land of migrants is well established and the migration phenomenon is well known.

No national survey had ever been carried out, however, to provide a comprehensive, detailed picture of the Upper Voltans' movements. This picture has recently been traced by a team from the Upper Volta Centre for Scientific Research (CVRS) and the National Institute of Statistics and Demography (INSD) of Upper Volta, coordinated by Mr Sidiki Coulibaly, now director of demographic research at the Ministry of Planning in Ouagadougou. During the course of the National Survey of Migratory Movements in Upper Volta 1974-1975, Mr Coulibaly, assisted by an IDRC bursary, obtained his doctorate, thus becoming the first person to receive a doctorate in demography from the University of Montreal. He was assisted in the survey by two consultants from the university, Joel Gregory and Victor Piché. The work was jointly funded by the government of Upper Volta and IDRC.

The National Survey of Migratory Movements in Upper Volta 1974-1975 began in 1973 with the training of staff and the establishment of structures that enabled data to be gathered from April

Upper Volta population on the move

Jean-Marc Fleury



Photos: Neill McKee

Women migrate to carry out their productive and reproductive functions in another village.

1974 to August 1975. The survey, conducted in 120 villages and 11 towns across the entire country, covered female and male, national, and international migrations. For the purposes of the study the country was divided into four areas: the rural Mossi country (about half the region around Ouagadougou); the rural west; nine secondary towns; and the two major cities of Ouagadougou, the capital, and Bobo-Dioulasso, the economic centre.

The analysis of the data collected quickly confirmed the magnitude of the migrations in Upper Volta. It was determined that during the 5-year period (1969-1975) dealt with in the survey, some 713 000 migrations had taken place, a migration being defined as a movement out of the sub-prefecture for at least three months. The strongest migratory flow — 205 000 migrations — was from the Mossi country to the Ivory Coast. For the first time an accurate measurement was made of the large migratory countercurrent (150 000 migrations) from the Ivory Coast to the rural areas of Upper Volta, the Mossi area in particular. Lastly, the researchers confirmed that the Mossi area also lost in its exchanges within the country as it was the major source of the 100 000 movements towards the rural west.

The calculation of migratory balances (the difference between arrivals and departures) provides an even better idea of the fate of the regions affected by population movements. During the five years studied, Upper Volta's balance with other countries was negative, with a net emigration of 170 000 reflecting very unequal exchanges with the Ivory Coast. Within Upper Volta, only the towns showed a positive balance, especially the principal cities of Ouagadougou (a net gain of 12 751 arrivals in relation to a total population of some 120 000) and Bobo-Dioulasso (a net gain of 9706 arrivals). The Mossi area showed the largest negative balance because it lost residents to towns, to the rural west, and to other countries. Although the rural west recorded negative net exchanges with neighbouring towns and with other countries, it recovered a good part of its losses from the agriculturally less productive Mossi country.

From the analysis of the data in terms of the sex of the migrants, the survey team was able to identify two distinct migratory groups, one male and the other female. The movements between rural areas are in fact predominantly female: within the Mossi area, three times more women than men migrate. The international exchanges, on the other hand, are dominated by men in a ratio of four to one. The questionnaires also revealed that most emigrants abroad are young men, many of whom return while they are still young. For this reason the team made a special effort to include among the migrants those persons who, although they now reside

at their birthplace, migrated at least once in the past before returning to their villages.

The tabulated data give a clear picture of the extreme mobility of the Upper Voltans. Some 22 percent of the population surveyed were found to have migrated at least once, and half of these at least twice. On average, almost half of the population in urban areas is made up of migrants (56 percent in Ouagadougou). Also, even though the Mossi and non-Mossi rural areas have approximately the same proportion of nonmigrants (80 percent), the Mossi country has twice as many returned migrants (15 percent) as the rural west.

Based on the study of the age, marital status, education, and ethnic origin of the migrants, the survey team identified four major types of migrations. First is the *employment migration* of young bachelors who leave to work as wage earners for a time, and then return to their villages to work the land. Next there is a large *marriage migration* of single women who leave to carry out their productive and reproductive roles in another village as a result of unions between families of the same ethnic origin: more than 80 percent of the women gave marriage as the reason for their migration. A third type of migration, *education migration*, explains the movement of a growing number of young boys and girls as school attendance in Upper Volta increases. Lastly, the authors of the comprehensive report on the national survey confirmed the existence of a sizable *migration of children* between the ages of 5 and 14 given into the care of other families, either to perform for the "adoptive" family certain household tasks traditionally reserved for children in that age group, or because there are no schools in their villages.

During their visits the researchers sought to determine the migrants' motivations. Sixty percent of those interviewed, particularly those aged between 15 and 24, stated that agricultural labour was not sufficiently remunerative to allow them to buy manufactured articles such as bicycles, radios, and mopeds. Only 12 percent gave as a reason their inability to support their family if they stayed where they were. There is neither a shortage of land, nor is it exhausted, since the great majority felt that land is sufficient and that any shortfall in agricultural production is due to labour shortages. Similarly, 87 percent of the nonmigrants stated that their region had not suffered from drought. The main reason prompting the migrants to leave their villages is therefore the desire to enter the "moneyed" sector of the economy in order to obtain the cash necessary for the purchase of certain goods.

But why is it, the survey team wondered, that in the same family and the same village some people migrate and others do not? The explanation is to be

Migrants often return home to work the land, as if they had never left.



found in the individual's position in the extended family. Ultimately it is the family that sends off some of its members and keeps others to tend the fields and see to the needs of those who remain. Even after leaving the migrant often remains in contact with the family, and 25 percent were found to write home. Moreover, 75 percent of the migrants already know their destination because a relative awaits them there, and they return home to live out their days. Thus the migration phenomenon in Upper Volta is in no way impromptu or the result of a spirit of adventure.

The comprehensive report of the national survey concludes with three chapters of quotes from Upper Voltans concerning migration. These statements gave the survey's demographers considerable trouble as they tended to contradict themselves depending on whether people were interviewed individually or in groups. When questioned privately most migrants and nonmigrants stated that it was good to have migrants in the family, and that the government should facilitate their movements. In group discussions, however, a clear majority denounced migration, saying that it was not only harmful to the country's economy but also to the health of the migrants. In a society like Upper Volta's, where social approval of individual actions carries considerable weight, it is almost impossible that such a dichotomy exist between individual choices and general opinion. The authors feel that this contradiction simply underlines the fact that the people of Upper Volta accept migration only because there is no alternative.

For Upper Voltans migration is not a good thing, but it must be tolerated. An old Mossi woman from Bobo-Dioulasso said of the government: "If it knows that by preventing them from leaving it can find them work, then stop them! But if it is not sure of providing them with jobs, then it must let them go." The authors summarize: "the people feel that migration is inevitable and necessary because the government does not have other means to meet the needs of the population".

What steps must the government take to discourage migration? The first suggested by those interviewed is the creation of remunerative jobs to provide people with the means to buy manufactured goods. The second, to help farmers by facilitating the purchase of agricultural equipment and fertilizer, by drilling wells, by improving the roads leading to markets, and by guaranteeing good prices for agricultural products. The report states that: "the common complaint is that more than once cotton buyers have come and automatically rated all the cotton in the village as third or fourth class, therefore paying less for it". People also ask for better management of the operation of cooperatives in order to combat speculators who purchase entire fields of millet and groundnut from farmers who have no choice but to sell. Another request is a reduction in taxes and greater fairness in recruiting employees for the public service. And because the search for a wife is one of the main reasons for leaving, and because young girls seem to be interested only in those who return with fancy clothes, some people suggest that girls be taught to appreciate those who remain behind better than the migrants.

As the survey team discovered, the glory that surrounds the returning migrant on his moped, resplendent in his new clothes and jewelry, quickly disappears. Usually, a few days after his return, the "prodigal son" finds that his meagre capital has been distributed as gifts to family and friends. He has little choice but to return to working the land, as if he had never left. Life in the village is in no way transformed by the influx of thousands of young men who have experienced life outside.

And yet, the desire for change does not appear to slacken. Says one farmer: "If we were given help to build a well, a clinic, a school, where would we then go? We would raise livestock, farm, and never again leave!" The government of Upper Volta and family members working in towns are presently the only sources of productive investments in the rural areas. If the returned migrant does not make similar contributions to rural production, it is perhaps because working in a large plantation or factory is poor preparation for becoming a successful small farmer. □

The dominion of the disease-bearing tsetse fly in Africa stretches over four million square miles — an area larger than the whole of Canada — preventing a productive livestock industry that might otherwise thrive and become a bountiful food resource.

The tsetse is a biting fly about the size of the ordinary household variety. The protozoal parasite that it carries, called a trypanosome, is microscopic. The disease it spreads is trypanosomiasis, which threatens about 35 million Africans and countless millions of cattle in a wide belt across the centre of the continent south of the Sahara.

African trypanosomiasis is a group of several disease syndromes caused by distinct species of trypanosomes. In humans the illness is usually fatal if untreated. Because it affects the brain and produces somnolence as one of its main symptoms, the disease is often called “sleeping sickness”. In domestic animals the type of injury produced by the disease varies with the species of trypanosome causing the infection. Some produce symptoms similar to those in humans, others are characterized by severe anemia.

About 10 000 new cases of human sleeping sickness are reported each year, although the actual figure is probably higher due to underreporting from remote areas and unrecognized symptoms. The World Health Organization (WHO) ranks trypanosomiasis in humans and animals as one of the ten major health problems facing the world today, among such other great enemies as cancer, heart disease, and malaria. Trypanosomiasis is also a focus of the WHO Special Programme for Research and Training in Tropical Diseases, described on page 3.

Trypanosomiasis has existed in Africa for centuries ... so long, in fact, that a balance has evolved between the Africans, their domesticated animals, and the populations of tsetse and game animals that act as a “reservoir” of infection without (as far as is known) developing signs of ill health. However, the arrival of the colonizers began a disruption of the African ecology that has resulted in trypanosomiasis being the immense biological problem it is today. The rapid development of territories during the colonial administrations brought massive movements of people within the continent. While some peoples were moving out of infected areas, bringing the disease organisms with them to new regions, the need for more land was forcing others to move into regions heavily infested with tsetse.

David Livingston, legendary explorer and missionary, observed and described animal trypanosomiasis 120 years ago. Although he never saw the parasite itself, he knew that the disease was carried by the tsetse. His scrupulous observations in *A Popular Account of Missionary Travels and Researches in*

Tight nets cast for African cattle killers

Rowan Shirkie

South Africa, published in 1861, still serve to describe the disease: “... its (the tsetse) bite is death to the ox, horse and dog. In this journey though we watched the animals carefully and believe that not a score of flies were ever upon them, they destroyed 43 fine oxen.” Dissecting an animal fallen victim to the disease, he notes: “The blood is small in quantity and scarcely stains the hand in dissection ... All the muscles are flabby and the heart is often so soft that the fingers may be made to meet through it ... The symptoms seem to indicate poison in the blood; the germ of which enters when the proboscis is inserted.”

Having in some ways created — or certainly contributed to — the problem of trypanosomiasis, the colonial administrations in Africa began to take steps to control the disease. The French instituted ambitious schemes for the diagnosis and treatment of large human and animal populations. By 1950, these control measures had reduced the human epidemics to small localized outbreaks. However, the French programs were expensive, irritating to the African population, and ultimately only partially successful because of the rapid development of strains of trypanosomes resistant to the available drugs.

The British approached the problem by attempting to eliminate the tsetse, and began programs to clear bush, spray vegetation with insecticides, and even to eliminate all wild animals in certain regions. Success here too was limited to small areas, and achieved at great expense and through frequently repeated sweeps. Massive application of insecticides and the extermination of wild animals now appears to carry an impossibly high price in terms of environmental consequences for the relatively brief and ineffective relief from trypanosomiasis it brought. (It has since been demonstrated that the tsetse fly often rests in tree tops, thus insecticides must be sprayed from aircraft to be truly effective.)

The growing independence and development of the African nations had a part to play in the history of this disease. Rapid political, economic, and social changes hindered the projects instituted by the colonial powers. At the same time, changes in Africa resulted in the exodus of expatriate scientists, entomologists, biologists, veterinarians, and medics who had been working on the disease. The “brain drain” left African research institutions hard-pressed to find the necessary human resources to continue the campaign against trypanosomiasis on the scale that was required.

The enforced abandonment of the old research programs because of lack of personnel has resulted in the establishment of new programs, which may actually prove to be more successful in arriving at a permanent solution to trypanosomiasis and other livestock and human diseases in Africa.

Earlier efforts to check this disease in Africa concentrated on methods to control the vector, the tsetse fly that carries trypanosomes after a bloodmeal from infected cattle or wild animals. But these control measures have not solved the problem. A number of governments and agencies have now joined together to support a cooperative research effort in Kenya with scientific assistance and funds. The training of African researchers is a key component of the program. The East African Community (now dissolved), FAO (UN Food and Agriculture Organization), Britain’s Overseas Development Ministry, USAID (United States Agency for International Development), and the Pfizer Company were among the cooperating agencies. IDRC contributed \$Cdn 500 000 in a first phase of research beginning in 1973, and followed with another grant of \$698 000 3 years later.

Also in 1973, IDRC, together with other members of the Consultative Group on International Agricultural Research (CGIAR), helped to establish the



Photos: Neill McKee

A government livestock inoculation camp is set up to help the cattle-raising Masai: drugs and vaccines can only be part of the solution.

International Laboratory for Research on Animal Diseases (ILRAD) on a 173 acre site north of Nairobi, Kenya. The new organization's task was to coordinate and renew efforts against trypanosomiasis and East Coast Fever, a tick-borne parasitic disease.

These new initiatives concentrate on learning much more about the host-parasite relationship, particularly the distribution of trypanosomes in the body system of cattle, how the deterioration of injured tissues progresses, and what immunological responses the parasite evokes. The lack of progress in developing control measures for the disease seemed to the researchers to be the result of poorly-understood, yet fundamental biological relationships between the disease-causing parasites and their hosts.

The experiments undertaken in the trypanosomiasis projects have resulted in several new and important discoveries concerning the changes that occur in animals infected with trypanosomes. Trypanosome species cause significantly different diseases in cattle, a discovery that emphasizes the general complexity of the disease and the need for development of specific measures for the treatment and prevention of each. Research has shown that the host-parasite relationships between cattle and *Trypanosoma congolense* and *T. vivax* (two of the commonest species of the parasite) are markedly different.

IDRC-supported research at the Ontario Veterinary College of the University of Guelph in Canada focused on the origin and development of trypanosomiasis caused by the *T. congolense* parasite. Undertaken to complement a larger program in Africa, the research was also aimed at providing training for African scientists, and was linked to the programs at ILRAD. The research successfully identified a number of trypanosome-derived factors (microbiological agents that produce the disease's effects), an important first

step in understanding — and combating — the disease.

The ability of *T. congolense* to injure its host is due in part to its capacity to form clumps or colonies in the small blood vessels, particularly in the brain and heart. This property may be the major factor in injury to the host. The disruption of these aggregates of parasites, through drugs or vaccines, could be very important in any future control programs.

However, information available on animal trypanosomiasis tends to suggest that it is unlikely that a single method of control could be effective against all the various forms of the disease. The problem of trypanosomiasis in cattle (excluding other animals, such as wild game, or swine) is in itself very complex: at least three major species of trypanosomes are involved; over 60 million head of cattle are infected; and under certain management conditions, mortality can reach 70 percent. Because of the complexity of the problem, it is likely that progress toward a permanent solution will take some time.

Incredibly, the trypanosome has a property that makes it even more difficult to control ... antigenic variation. In simple terms, antigens are the products of the biological activities of living cells, like the trypanosome, that are foreign to the metabolism of the infected host. The invaded metabolism produces antibodies that attack and neutralize the antigens; the presence of antigens in fact stimulates this process. However, the antibody must specifically match the antigen in order for it to be effective. The trypanosome can produce many antigen variations during the course of an infection. Researchers have not yet been able to determine precisely how many variants trypanosomes produce, but indications are that the number is limited only by the length of time the host lives! Influenza shares the same sort of property, which

is why every year seems to bring a new strain against which last year's vaccination is ineffective. In trypanosomiasis the action is much more rapid, something equivalent to having all the different strains of influenza one after another. The host's body defenses are rapidly exhausted, and even begin to turn on themselves.

Interestingly, wild animals in Africa are believed to be resistant to trypanosomiasis, but highly susceptible to infection by trypanosomes. This apparent contradiction is actually an indication that the host-parasite relationship in wild African animals had evolved naturally. Healthy wild animals may serve as reservoirs for trypanosome parasites, yet be resistant to the disease. This "trypanotolerant" state is one that researchers wish to study closely, because if the information gathered on the immune responses of game animals can be applied to domestic ones, the way may be open toward permanent control of the disease.

A project to study wild animals as reservoirs of infectious diseases and parasites of domestic stock was begun in 1967 by the Kenyan government and has been continued since 1975 with assistance from FAO, the Canadian International Development Agency (CIDA) through IDRC, and the Netherlands Foundation for the Advancement of Tropical Research.

The project was to determine the risk of disease transmission between wild and domestic animals, research control measures, and train Kenyan veterinarians in wildlife disease research in order to maintain the program independently in the future.

As in most African countries, land use decisions in Kenya are extremely important to development, and also as in many African countries, large stretches of land are unsuited for crop production. The milk, meat, and hides of grazing livestock are the chief agricultural products to be derived from these lands. Traditionally, these areas are shared with wild animals ... specifically the wild ungulates, hooved grazing animals such as giraffe, eland, wildebeest, and buffalo. It is in this pattern of interrelationships that disease transmission between wild and domestic animals becomes an important consideration. Competition for space, forage, and water between livestock and game has always been a consideration in grazing land use in Africa. Now, researchers are beginning to view disease as another special form of wildlife-livestock competition. Even if certain species of wild and domestic animals are compatible in every other way, the fact that wild species may contribute to disease outbreaks in domestic stock may make them unwelcome.

In Kenya, the association between cattle, wildebeest, and a disease known as malignant catarrhal fever has made the wildebeest an enemy to the cattle-

The tsetse fly carries trypanosomes from game animals to cattle, wreaking death and disease.



A researcher performs a white blood cell count of a sample from an infected animal.



A bone marrow sample is extracted from a calf, one of many kept at the Muguga research station in Kenya to study the spread of East Coast fever.

raising Masai. In another similar relationship, buffalo transmit a special form of parasitic disease to cattle. Neither the wildebeest nor the buffalo develop the disease they harbour. Some have suggested that because wild game resists disease, and survives on poor pasture and scant water, game ranching should replace the raising of cattle, sheep, or goats. However, the management practices — indeed any sort of management other than allowing game to range freely — required to ranch game would lead to new wildlife disease problems. Many of the sources of disease in wildlife may be quickly removed by predators or scavengers that feed on the sick and dead in a free-ranging environment. Ranching would likely change this ecological balance by protecting wild stock against predators and scavengers.

A team of researchers from the Veterinary Research Department of the Kenya Agricultural Research Institute in Muguga have been engaged in the project, capturing wild animals with tranquilizer guns and nets, and extracting blood samples. The blood samples are inoculated into goats and mice that act as hosts to keep the disease organisms of trypanosomiasis alive for analysis. Buffalo and giraffe were most frequently found to be the carriers of trypanosomes. Other captured animals, something of a cross-section of grazing life in Kenya — warthog, zebra, eland, wildebeest, waterbuck, kongoni, impala, dikdik, and Grant's and Thomson's gazelles — seemed to contribute little or nothing to the reservoir of trypanosomiasis. Although it is probable that giraffe and buffalo are the major sources of the disease, the transmission route to cattle, sheep, and goats follows both directions: the tsetse carries the disease back and forth between livestock and wildlife. The infected wild animals are healthy, but the domestic animals inoculated with their blood trypanosomes develop fatal infections. Further experiments involving live captured game and offspring bred in captivity will offer the opportunities needed to study the trypanotolerance mechanism more thoroughly.

Meanwhile, the battle against the disease moves on other fronts. IDRC supports a number of projects to eliminate the tsetse vector itself. Because of the insecticide resistance developed by tsetse, new approaches are being sought through biological control. Tsetse themselves are preyed upon by parasites, and it would be poetic justice if the same sort of infective mechanism by which they cause so much harm could be turned against them. Parasitic worms and wasps are one approach, and the use of predators such as spiders, ants, and other flies that prey on immature tsetse are another.

USAID and the IAEA (International Atomic Energy Agency) are both trying

to breed the tsetse out of existence. Their method is the sterile male technique, developed in the United States to combat a pest called the screw-worm fly. By releasing male tsetse sterilized by radiation to mate with the female tsetse, which mates only once in a life cycle, an entire generation is eliminated. The USAID experiments, successful under laboratory conditions, became somewhat more problematic under field conditions in Africa. During one part of a recent test of the technique, on Mkwaia Ranch near Tanga where a special isolated test site had been created out of the bush, experimenters recorded a sudden increase in the wild tsetse population — an indication of total failure. No one could account for the increase in tsetse population, until it was noticed that a herd of about 20 giraffe was crossing and recrossing the barrier clearing, bringing with them new tsetse populations.

The intrusion of the wildlife carriers illustrates the nature of the problem, and points toward the best approach to solving it. Sterile male techniques, biological control of tsetse through predators and parasites, insecticides, drug programs, bush clearing, wildlife control, and research into the pathogenicity of trypanosomiasis — all these leads — must be pursued, and the experience gained and successful tools developed combined to produce an integrated approach to eradicating trypanosomiasis. Nothing short of an all-out combined effort will do. The nets cast for the tsetse and trypanosomiasis must be closely woven, with no holes for them to slip through. □

IDRC sponsored a conference on trypanosomiasis in Nairobi, Kenya, 20-23 November 1978. The conference was hosted by the Veterinary Research Department of the Kenya Agricultural Research Institute at Muguga, and cosponsored by the Canadian International Development Agency (CIDA), and the International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, Kenya.

The conference, "Recent Advances in the Knowledge of the Pathogenicity of Trypanosomes," focused on the African trypanosomes that are pathogenic to cattle. It sought to exchange information on the different species of the parasite and the forms of disease produced by each, and on how this knowledge could be used to improve or develop more efficient diagnostic and control measures. The scientists attending also examined how laboratory research and experimentation related to the realities of human and animal trypanosomiasis. The proceedings of the conference will be published by IDRC later this spring.

“The future is theirs the responsibility is ours”

“The future is theirs. The responsibility is ours.” This is only one of the many slogans coined to mark 1979, the International Year of the Child. It is perhaps one of the more insightful ones, however, since the Year of the Child is not only about 1979, it is about the future.

That 110 million children under five live in absolute poverty, 160 million have inadequate diets, 140 million no access to health facilities, and that vast numbers will receive little, if any, schooling, are sad facts. But what is sadder and more serious still is what these statistics hold for the future when these same children are shaping the world and, by the year 2000, when the number of children has grown to over two billion.

It has become fashionable to talk of children's rights. But as a recent report of the Canadian Council on Children and Youth entitled *Admittance Restricted: The Child as Citizen in Canada*, points out: “Human rights are indivisible: they are not to be parcelled out to different segments of society at different times and under different circumstances”. Because of the dependent status of children, it is impossible to talk of children's rights, lives, or fates separately from those of their parents and of their communities.

This is not to say that we can ignore the special needs of children. Says the report: “Society has an obligation to supplement the resources of the family through education and other means so that the lives of children need not be restricted by the facts of their birth; so that all children can acquire the skills necessary to exercise their basic freedoms as citizens; so that having acquired those skills, they may make an unhampered contribution to their society.” Although addressed primarily to Canadian society, this statement sums up what the International Year of the Child is about, what every year should be about, in both industrialized and developing countries.

Our obligation is to ensure that today's children are physically, emotionally, and educationally equipped for the future. Our responsibility is to meet their needs for health care and nutrition, protection, economic support, and education. It is a task that demands the concerted effort of health personnel, educators, planners and policy makers, agriculturalists, foresters ... of all of us. The task is development.

Admittance Restricted: The Child as Citizen in Canada, is available from the Canadian Council on Children and Youth, 323 Chapel Street, Ottawa, Canada, K1N 7Z2.



Photo: Marilyn Campbell

Breastfeeding benefits mother and child

The breastfeeding versus bottlefeeding debate has raged in recent years as the detrimental effects of bottle feeding babies are fully recognized in many developing countries. Because infant formulas are expensive, they are beyond the means of many poorer rural families. The formulas are therefore over-diluted, resulting in infant malnutrition. Lack of clean water and fuel also makes it difficult to sterilize the bottles and the formulas, leading to diarrhea and other gastrointestinal ailments.

Many nutritionists now consider that breastfeeding of infants in many of the poorer countries is crucial to their development, and in many cases to their survival. Not only is breastmilk a complete, healthy food, but breastfeeding allows for the development of a close mother-child relationship, transfers nutrients and immunity against diseases, and by avoiding contact with bacteria and allergenic materials that can contaminate substitute foods, reduces gastrointestinal and respiratory ailments.

Full breastfeeding also helps to prolong the mother's natural period of infertility, protecting her from an early pregnancy. One of the disadvantages of breastfeeding as a contraceptive, however, is that it is not always effective, and there is no way of predicting when ovulation will return. Most family planning programs therefore recommend the use of contraceptives early after the birth of a child. The effects of contraceptives during nursing are not fully known, however. The use of pure synthetic progesterone, such as is used in some types of pills, for example, while it has been shown to increase the milk flow and prolong lactation, may entail a passage of the drug into the milk in an active form, causing possible adverse effects on the infant. Other types of pills reduce milk production.

In an attempt to prolong full nursing of the infant and help maintain the mother's natural infertility for as long as required by both mother and child, the National Centre of the Family in Chile is testing methods that will prolong the period of infertility while having no adverse effects on lactation, thus extending both processes to the benefit of mother and child. Supported by IDRC, the project is investigating two substances. The first is natural progesterone that does not have any adverse effect on women. When administered orally, it is almost completely inactive, and thus cannot harm the baby. This substance is in fact present in large quantities in cow's milk which is the most frequently used substitute for mother's milk.

A plastic IUD impregnated with synthetic steroid, methyl norgestosterone, is now being tested. This IUD releases the hormone daily to act locally on the membrane lining the uterus — the endometrium — suppressing its development. As a consequence, infertility and lactation are prolonged.

To date some 75 women who had expressed a desire to space their next child and wished to breastfeed their baby have participated in a pilot study. Preliminary results have shown that babies who were completely breastfed during their first six months developed well. No untoward effects have appeared as a result of the treatments. The study has also confirmed that pregnancy is a rare event in full nursing mothers during the six months following the birth of a child.

One of the 10 articles of the UN Declaration of the Rights of the Child adopted in 1959 reads in part: "The child ... shall have the right to adequate nutrition". Today, 20 years later, protein-calorie malnutrition remains a major problem in most developing countries. In Thailand, for example, it is estimated to affect some four million children and two million pregnant and nursing mothers.

The problem is not solely caused by not having enough to eat. As many nutritionists point out, calorie-protein malnutrition cannot be prevented by increasing the quantity of the traditional diet consumed by children. Says Dr Nevin Scrimshaw of the Massachusetts Institute of Technology (MIT): "It is useless to suggest that a child can get sufficient protein and calories from a cereal diet if he merely eats more of it, when he is unable to do so." The traditional cereal-based diet of the developing countries is in fact frequently

Improving infant diets: three approaches

Michelle Hibler



Photo: Neill McKee

bulky, young children simply do not have the capacity to ingest the large quantities that would be necessary to satisfy their full nutrient requirements.

The problem is further aggravated by the high incidence of infectious diseases and debilitating parasites that create a greatly increased demand for protein and energy. During the post-infection recovery, young children may need 40 percent more protein than is necessary for normal, healthy growth. And children are at their most vulnerable following weaning. The word "kwashiorkor" that designates severe protein deficiency comes from Ghana and can be very roughly translated as "the sickness suffered by the young child shortly after being replaced at the mother's breast by the newest arrival".

The populations of developing countries rely mainly on cereals, legumes, root crops, and other plant sources for most of their calories and protein, and will probably continue to do so for many years to come. The amino acid composition of cereal grains and legumes are complementary and a combination of two parts cereals to one of legumes provides a protein of good nutritional quality. Unfortunately, because of their relatively low yield, per capita production of legumes throughout the developing world is declining in relation to cereals, and only in Latin America are they consumed in sufficient quantities to satisfy protein requirements.

Increasing yields and the quality of both cereals, such as sorghum and millet, and of legumes has been one of the priorities of the IDRC. In addition, the Centre has been assisting food technologists and home economists to devise simple technologies to enable rural processors to convert legumes to forms that can be acceptably combined with cereals in order to promote their utilization. Following are three examples of the work underway and that may help alleviate protein-calorie malnutrition in children of the developing world.

- Solving nutritional problems, particularly protein-calorie malnutrition in young children and mothers, has been accorded a high priority in Thailand's Fourth Development Plan. As part of this effort, the Institute of Nutrition of Mahidol University in Bangkok developed and tested five recipes for weaning foods using vegetables and legumes that can be grown in the country's 27 most affected provinces, mainly in the rural northeast. Supported by the IDRC, the Institute is now testing the acceptability of the infant foods and the methods required to produce them in three villages.

Based on the results of the project, recommendations will be made to the Thai government regarding nutrition programs for the target provinces. And because the crops being used are common to many Southeast Asian countries, the results of

the project should also assist other countries in their fight against infant malnutrition.

- In Nigeria, as in many other African countries, packaged flours and processed foods, often using imported wheat flour, have been gaining in popularity in recent years. A survey carried out in Maiduguri, the capital of the North Eastern State, revealed that a great number of households purchased bread, and children in 40 percent of the households received money for snack foods.

As part of a project to establish a pilot mill for processing local grains — sorghum, millet, and cowpeas —, the University of Saskatchewan's College of Home Economics participated in developing high protein products from the mill's flours. A technique for preparing noodles and fried snacks containing various blends of the flours was established: nutritional evaluations confirmed they contained approximately 15 percent protein. Other products such as breads and infant and weaning foods of high nutritional quality were also developed to use the local flours.

- Many food aid programs have had the unfortunate effect of creating a dependency on imported soybeans. Yet, in some countries, local grain legumes could replace this expensive product, saving precious foreign exchange and promoting local crops.

Lupino, a legume similar to soybean, has been cultivated and consumed by the indigenous Andean people for centuries. A high-yielding, high protein crop, it can be grown on marginal lands that are presently unused.

In Chile, a project is underway to develop methods of substituting lupino for soy in presently used products such as defatted and textured flours used in processed products and meat substitutes. As well, blended products — mixtures of cornmeal, lupino flour, dry skim milk, minerals, and vitamins — will be prepared and tested. This product will be of considerable importance as a low-cost infant food, particularly for the Mapuche Indians, an extremely poor segment of the population which presently grows 75 percent of the lupino in Chile. □

The IDRC has published two books dealing with the use of tropical cereals and legumes in developing countries. Cowpeas: home preparation and use in West Africa, (IDRC-055e), describes the nutritional qualities of this legume as well as its processing and contains numerous recipes. Sorghum and millet: food production and use, (IDRC-123e), deals, among other topics, with the production, processing and use of these cereals, and includes recipes for a number of dishes based on them.

Grim statistics useful

In Botswana, 97 children out of every 1000 born will die before their first birthday. In Kenya, the figure is 119; Nigeria, 157; Senegal, 159. Many more will not survive to adulthood.

These statistics, provided by the Population Reference Bureau for 1978, paint a dismal picture of disease, malnutrition, inadequate shelter, and lack of clean water. But there is some comfort in knowing the causes and extent of the problem because they enable planners and decision makers to set priorities, design, and implement programs to remedy the situation.

In a number of francophone African countries, the lack of statistics has frustrated efforts to identify the socioeconomic and cultural conditions that contribute to high infant mortality rates. The absence of this data makes it difficult to estimate population growth, particularly of the school age population, for planning purposes. It also makes it difficult to assess the impact of environmental health, nutrition, and other programs.

Efforts to train professionals capable of studying these problems began in 1972, when the government of Cameroon and the United Nations supported the creation of a regional demographic and training centre — l'Institut de formation et de recherches démographiques (IFORD) — in Yaoundé, Cameroon. In 1976, IFORD took the leadership in developing research capacity and scientific knowledge in the region. A research program designed to fit the regional policy needs and current levels of research capacity was initiated and is receiving IDRC support.

Methodology-oriented studies of infant mortality are being launched in order to develop appropriate methods of measurement for the region, give accurate data for policy interpretation, and train investigators.

During the next two years, surveys will be conducted in urban and rural regions: a register of births will be kept, and follow-up interviews conducted at regular intervals. This will permit a more precise estimate of the exact timing and circumstances surrounding the death of an infant.

A preliminary analysis of sample characteristics and of the correlates of infant mortality should be possible at the end of this period, opening the door for more ambitious studies and comparative analysis vitally important in the region.

A question of survival

Bob Stanley

In the cities, towns, and villages of the Third World, children seem to be a permanent part of the scene. While their counterparts in the industrialized world are safely locked away in school until at least their mid-teens, most Third World children count themselves fortunate to have the opportunity to attend school, even irregularly, for a few years before the need to earn a living becomes too pressing a priority.

For most families in the Third World, keeping children in school is a luxury they can scarcely afford. In the country there are always crops to be planted or harvested, animals to be tended, fields to be tilled — just to make enough money to live on. In the towns and cities children help run the family business, or earn a little money any way they can, running errands, selling cigarettes, washing cars, shining shoes.

Lacking education or opportunity, few will ever graduate from unskilled labour. Some, unable to find even that, will turn to petty crime for "easy" money.

The International Labour Organization (ILO) estimates that in 1975 there were some 52 million children in the work force, and the number is growing. If present trends continue, says the ILO, 4 out of every 10 workers in the developing nations will be under 15 in the year 2000.

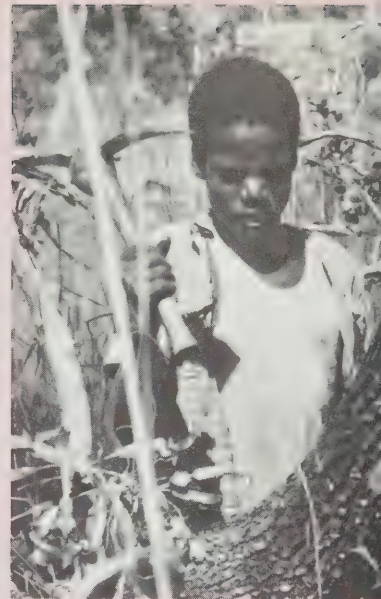
Yet the "problem" of children in the workforce is not an easy one to approach. They are there because they are needed. To remove all those children and place them in schools (even assuming there were enough classrooms and enough teachers to cope with them) could have a disastrous effect on national economies. And the first victims would likely be the children themselves.

The subsistence farmer depends on his family to help run the farm. Take away his children when they are most needed and the crops may fail. And the family will not eat.

Crafts like carpet-weaving must be learned at an early age, before the fingers lose their suppleness. So the child learns a valuable skill, but often the price in terms of health and educational development is high.

The child who is driven by poverty to choose work instead of education is probably already suffering to some extent from the multiple physical and mental effects of years of malnutrition and disease.

The problem does not lend itself to one neat solution — most children at work in the developing countries are trapped in a vicious cycle that no amount of well-intentioned regulations will break. In the long term the only way to break out of the cycle is through development that, by attacking the root causes of the situation, will eliminate the need for child labour.



Right, top: Work on the farm replaces school for this young African, like for many of his counterparts in the Third World. Centre: Looking brightly to a better future. Bottom: Mothering is learnt early — a small girl in Nepal cares for her younger brother.



Photo: Neill McKee

Left, top: This young banana vendor may have helped grow the crop as well. Centre: For a few pennies, these Colombian boys will carry your purchases home from market. Bottom: Silversmithing in Indonesia, like many crafts, must be learnt at an early age.



Photo: Neill McKee



Photo: Roberta Borg

Above, top: Carrying water is a task reserved for women and children. This Masai girl may have to walk many kilometres to the nearest water source. Bottom: Hawking cigarettes in Jakarta — business is slow.



Photo: Michelle Hibler

Feed the body and the mind

Elizabeth Fox de Cardona

An estimated one-quarter of the population of developing countries suffers from malnutrition, many of them children. In Colombia, for example, malnutrition is responsible for 45 percent of the deaths of children under five, and half of the country's children — some two million — suffer from malnutrition to some degree.

Infant malnutrition is not only a health problem, however. It has a direct bearing on the learning potential, education, and intelligence of the young and on the role they will eventually play in the economy. Research in developing countries has also shown that malnutrition in low-income groups exists as part of a general syndrome of multiple environmental deprivation, an important component of which is sociocultural deprivation.

The treatment of multiple environmental deprivation by governments and agencies usually calls for nutritional supplementation. Two recent studies carried out in Latin America have shown, however, that if disadvantaged children are to fully recover from their early years of deprivation, nutritional supplementation programs need to be complemented by mental enrichment programs — "mental supplements".

In August 1970, the Human Ecology Investigation Station of the University del Valle in Cali, Colombia, began to study 368 3-year old children, all but 33 of whom were from low-income families. The study was to determine how daily nutritional and health care could improve their physical, intellectual, and social development. Organized into eight experimental groups, all the children received health care and nutritional supplements. Three groups, however, received continued psychological and educational intervention during the three years of the project.

The researchers concluded that the children born and brought up in marginal environments were significantly below their potential levels of physical and social competence. Nutritional supplements and health care at this age produced more than normal increases in the growth of these children, but did not by themselves increase intellectual and social ability. The researchers found that a program of educational and



Photo: Jaime Rojas

Pre-schoolers in Colombia receive food supplements: their minds must be nourished too.

psychological stimulation administered at the same time could produce more than normal increases in cognitive and social development, at least during a year of integrated treatment. The earlier the intervention, the higher the level achieved. In short, what the researchers proved is that although food supplements and health care given to malnourished children can begin to compensate for their differences in physical growth, they alone cannot compensate for their deficiencies in mental development.

A similar study carried out by the Colombian Institute of Family Welfare in Bogota focused on younger children, following their development from birth to age three. The chosen families were from low-income groups, in all of them the mother was in the first six months of pregnancy and at least half of the children under the age of five were malnourished.

The children were divided into four groups (including a control group); all received health care. One group, however, also received psychological and educational stimulation during the three years. In another group, the entire family received food supplements. In the last group, the entire family received the supplements and the target child also received psychological and educational stimulation. The intervention took the form of twice-weekly visits by a specially trained visitor who stimulated the child, and if necessary, helped modify the interactions between the parents and

the child so that this stimulation would continue even when the visitor was not present. Appropriate activities were found for the child within his environment and new games and activities were devised.

The study showed a noticeable effect produced by the food supplements. There also appeared to be an interaction between the supplementary feeding and infant stimulation, the end result being a pattern of child growth similar to the "standard growth curve".

If nutritional supplementation alone cannot prevent the effects of malnutrition in its broadest sense, neither can mental supplements alone. A number of studies carried out on educational television programs for children have shown that they benefit advantaged children much more than the disadvantaged groups for whom they are intended. In Mexico, for example, urban and rural children from economically deprived families were exposed to *Plaza Sesamo*, a Spanish version of the American *Sesame Street* program, and to other filmed material for children. According to the researchers, "the most striking outcome of the study is the ineffectiveness of *Plaza Sesamo* to improve significantly the cognitive development of rural pre-school children".

The authors of the evaluation suggest that one of the ways in which the gap between the learning performance of advantaged and disadvantaged children can be closed is by providing related forms of stimulation and reinforcement, particularly in the form of interpersonal communication with the children.

What this means for national development programs and plans is that nutrition programs cannot be separated from other rehabilitation programs such as the use of educational television and other forms of mass and interpersonal education. Without this integrated approach, real performance cannot change.

In view of the situation, it becomes important to develop workable mass programs of infant mental stimulation, transmitted both directly through a mass medium such as television, and indirectly through parents. To do so will require learning more about different methods of infant mental stimulation and learning to translate this knowledge into action programs. But above all, it requires motivating the parents to help their children develop mentally as well as physically. □

This article is adapted from a report on "Malnutrition, mental development, and the use of educational television: some suggested areas of enquiry and research" prepared by Elizabeth Fox de Cardona, Assistant to the Information Sciences Division Representative at IDRC's Regional Office for Latin America and the Caribbean in Bogota, Colombia.

Educational primer for Jamaica

by Michelle Hibler

It is shortly past noon. Hundreds of children in neat bright uniforms stream out of schools onto the hot sidewalks of Kingston, Jamaica. Their school day is over, the classrooms are now needed for a second shift of students in the afternoon.

Limited resources for constructing more schools is only one problem facing education in Jamaica today. More crucial is the low achievement of students in primary schools. An estimated 53 percent of the students who reach age 11 or 12 lack the necessary literacy, numeracy, and learning skills to cope with secondary education.

The causes of this sad situation are many. Although a national primary school curriculum has been in use in recent years, half of Jamaica's teachers — mainly in the rural areas — are not professionally trained. This poses great difficulties, as the instructional materials are mostly teacher-oriented and thus require that the teacher adapt them to the local situation, something many of the "pretrained" teachers (those who are not professionally qualified) cannot do.

Even if these problems were solved, others loom large. Among them are: a significant drop-out rate; absenteeism; and a seeming lack of motivation, especially in rural and remote areas. "The reasons, of course, are many and complex," says Mrs Lola McKinley of the Ministry of Education.

Recognizing these problems, Jamaica's 5-year development plan in education calls for the provision of an "effective and efficient system of primary education which will mold the child's attitude to learning and provide at least the basic skills and competencies for his continuing development". To meet these goals, the Ministry of Education is planning to undertake a number of projects on an experimental basis, each of which will address different aspects of the problems associated with pri-

mary education. Project Primer, an innovative delivery system for mass primary education adapted from the Impact system developed with IDRC support in Indonesia and the Philippines, is one of these.

Adaptation rather than replication is the key. As Mrs McKinley, who will direct the project, says: "We can't count on things that aren't there". In fact, Impact is an acronym for Instruction Managed by Parents, Community, and Teachers, a concept that is not readily transferable to Jamaica. In the Philippines, for example, the project made use of a very strong family structure. The family structure in Jamaica is very different and has to be used in a different way as a motivating force. Also, primary education is now seen to be the total responsibility of the government. "The level of community involvement has to be brought back into the picture", explains Mrs McKinley, "we can't be optimistic enough to expect the same kind of assistance as in the Philippines from the beginning."

The rationale behind Project Primer, which stands for Project for Reshaping and Improving the Management of Educational Resources, is also somewhat different. Whereas in the Philippines and Indonesia Project Impact sought to use one professional teacher for managing many more students and consequently reducing educational costs, Jamaica is starting from a different perspective. "The government of Jamaica has affirmed that the improvement of the quality of primary education is a priority. Consequently, it is unlikely that expenditures on primary education will decrease. Rather, the government will seek to implement more efficient methodology and techniques to make it more cost-effective," explains Mrs. McKinley.

Despite the differences between Southeast Asia and the Caribbean, some of Impact's components can be applied. Perhaps the most important is the approach. Mrs McKinley was part of a delegation from Jamaica who visited the project schools in the Philip-

pines. "We saw things there that we have seen here at some time or another," she says, "but never as a package, working together all at the same time." And it is the "package approach" that Project Primer will introduce to Jamaica's primary schools.

Some aspects of Jamaica's schools lend themselves well to the experiment. For example, in some rural schools, only one of perhaps five teachers may be qualified. The professional teacher is assigned to a particular grade, but she is also needed to assist and supervise the pretrained teachers, to the extent that her own grade is often neglected. "We need to free the teacher from her responsibility for a single grade to assume a monitoring role", says McKinley. The teacher would thus become the equivalent of Impact's Instructional Supervisor, a role for which she now needs to be adequately prepared.

Project Primer will also make use of programmed materials. In Asia, Impact called on the older primary students, those in grades 4 to 6, to teach the younger pupils lessons in reading, mathematics, and other subjects. According to Mrs McKinley: "It will not be possible for us to put 12-year olds to work with 7-year olds". But as many of the rural schools are "all-age" schools, the older, more mature students aged 13 to 15, as well as the graduates of these schools, can be trained to assist program teachers. "We may use a different level of pupil", says Mrs McKinley, "but without necessarily losing the important child-to-child contact."

In the more advanced grades, learning will be largely individualized and self-paced, using modules — simple booklets that cover the subject matter and that children can work through by themselves — as in the Impact system. Pretrained teachers already in the schools will work as tutors. Project Primer will also draw on community resources in teaching skills such as carpentry, agriculture or homemaking, where these exist.

Project Primer is expected to get underway by April this year, with IDRC support. The first 12 months will be devoted to developing learning materials, designing pre- and post-tests, and collecting and analyzing baseline data. Implementation is scheduled for the 1980 school year.

According to Mrs McKinley, the project should demonstrate that there could be significant improvements in student achievement without major additional expense. "You can't expect a single project to solve all our problems in three years", she says, "but I am convinced that it can go a long way to indicating where our needs can be met more effectively... That a child has learnt to teach himself, to take responsibility for his own learning — he is better-off. You can't ignore that", she says. □



Mrs Lola McKinley will direct Project PRIMER.

Photo: Jaime Rojas

Measuring the value of children

Rowan Shirkie



Why do people have children? This is the question Asian researchers have set themselves as they look for new approaches to one of the most sensitive and urgent concerns of development: how to slow down rapid population growth. It has, in fact, been increasingly realized that family planning programs and socioeconomic development programs designed to encourage reduced fertility cannot be fully effective unless they are founded on a comprehensive knowledge of the social, economic, and psychological reasons behind parenthood.

These reasons may differ from place to place and time to time. In 1972, IDRC and the Ford Foundation jointly supported a cross-national "Value of Children" study in rural and urban areas of Japan, Korea, the Philippines, Taiwan, Thailand, and Hawaii (USA) that reveals that some reasons for having — or not having — children are very nearly universal.

Although it may be argued that it is impossible to quantify the value of children, and that parents may not necessarily make conscious decisions about family size, few of the more than 5000 parents surveyed in the six countries indicated that they had never thought about the reasons for choosing their family size or believed that it was only a matter of fate.

Perhaps not surprisingly, the results of the study, now in its third phase, show that emotional benefits of children are foremost in the minds of parents, particularly parents living in urban areas. The love between parent and child and the joys brought to the household by children were said to be major sources of happiness and satisfaction in their lives. While the study notes that there is no equivalent to these feelings, the reports published to date suggest that alternatives to childbearing may bring acceptable, similar, benefits. Occupations that involve direct contact with children, for example, or new living patterns where the responsibility for the care of children is shared by a larger

community of adults may become valid alternatives to individual parenthood.

Parents in rural areas, on the other hand, were more likely to stress the economic benefits and the security that children brought. Often considered to be the "poor man's capital", children provide labour in the fields and household, are a source of additional income and, perhaps more important, can care for their parents in old age. As economic conditions improve, however, the economic value of children decreases. To stimulate this "devaluation" process, researchers and planners have often suggested implementing programs of old age pensions, housing allowances, and health care that would provide the same measure of security. Parents, they say, might then limit family size, therefore providing better opportunities for fewer children.

The social and psychological satisfactions of parenthood were also shown by the study to be important considerations. In many cultures, adulthood and parenthood are strongly linked and recognition as an adult follows from becoming a parent. As these values and beliefs are deeply rooted in culture and society, changing them is a long term process involving emphasizing alternative means of reaching these goals — careers, further education, and other activities involving individual growth and development.

If there are satisfactions to having children, there are also costs. Parents in all countries and from all social classes gave straight economic costs as the primary reasons for limiting family size. Even so, few of the parents were able to confidently estimate how much they actually spent on feeding, clothing, housing, healing, and educating their children. Most felt that they could afford larger families and that, in the long run, they would stand to make economic gains from children.

Parents also ranked the emotional costs of children very highly, and the study further suggests that emotional costs are most important for couples

who are considering having their first child. Parents reported that they did not fully anticipate the worries and strains, discipline and behavioural problems their children brought. These sorts of costs also appeared to be more acutely felt where adequate housing and playing space available, the more the frictions and aggravations increased with family size.

Finally, the debit side of children includes the restrictions they place on the parents' lives. The time and resources spent on children generally mean less for other activities. Urban parents ranked these "opportunity costs" as highly as emotional or economic costs, particularly women who have had to abandon or interrupt their careers.

The third phase of the Value of Children project extended the research over an additional 12 countries, and covered a broader range of fertility levels and cultural environments. The early results of this phase confirm the previous studies. The value of children is in transition. In the early stages of the transition, economic and physical improvements free children from premature death and the need to provide labour in the home or on the farm. Children come to have a special, protected status. In later stages parents are freed from children, or at least from too many children, and children are not valued so much for what they can *provide*, but more in terms of what they *require*.

The approach taken in the Value of Children study takes into account the needs and hopes of people as individuals, parents and family members, as members of a community and of a society. In asking "Why do people have children?", the researchers have followed a course of investigation that has taken them back to the essentials of human behaviour and psychology. In order to find an answer to the human population problem, you must begin by understanding humans, they say. □

What do reincarnation, leprosy, nuclear energy, fruit trees, daylight saving time, bullock carts, water hyacinth, and electric cars have in common? Well, nothing actually, except they were all subjects of stories written for Asian newspapers as part of a 2-year science news feature service project supported by IDRC.

The project was a response to a request first made in 1975 by Amithaba Chowdhury, then chief executive of the Press Foundation of Asia (PFA), for support in launching an airmailed news feature service focused on science and technology as they related to development in Asia. Chowdhury felt that there were many weaknesses in Asian media coverage of technological development and science-related issues, and echoed a need expressed during a seminar of Asian science writers held the previous year for more background material, more models of good science writing, and for reports and analyses of science and technology not usually available through the news and feature agencies then serving Asia.

The Press Foundation of Asia itself had been created 7 years earlier, in 1968, for similar reasons. Journalists were concerned that media in Asia did not truly reflect or serve Asian needs, that it often had a foreign bias toward the superficially dramatic or simply entertaining. The PFA was established to upgrade professionalism among Asian media personnel, orient Asian media more toward their role in development, and offer training opportunities. According to the founding journalists, development required that many people be informed about, and motivated to accept and use, a sizeable body of previously unfamiliar ideas and skills in a lot less time than the process would normally take. In short, they saw that communication was the essential spring release for the "great leap forward" into modernization.

Part of the PFA activities was the production of DEPTHnews Asia, a news service that offered Asian media a different perspective on development and news, one that dealt ... as the name implied ... with Asian issues in depth. DEPTHnews Asia was published in English, Bahasa, Melayu, Hindi, Korean, Mandarin, and Thai, and distributed weekly to about 230 media outlets in 23 countries. The PFA proposal was for the addition of a science component to DEPTHnews Asia that would help increase "science literacy" — public understanding of the role science and technology play in development. The PFA requested an experienced editor from one of the developed countries to launch the service and train an Asian replacement to continue it.

Mack Laing, former science editor of the *Toronto Telegram* and now assistant professor in the School of Journalism at the University of Western Ontario in

Science news that's fit to print

Rowan Shirkie

Canada, was contracted to establish DEPTHnews Asia Science Service. He says: "The experiment was a 50-50 success, or 50-50 failure, depending on how you want to look at it. We had about 300 stories in the pipeline to a network of 200 Asian papers during the two years. The stories were printed widely, and regularly. The failure lay simply in the fact that, while the Asian newspapers used the science stories, they would not buy the service." It had been hoped that the service would become self-supporting during the second year through sales to subscribers.

Speaking at a special postproject briefing session at IDRC in Ottawa early in the new year, Mr Laing said that although the service did not set out to become a profit-making operation, it would have certainly helped the nonprofit PFA to move away from dependence on grants money and the operational uncertainty that goes with it. Because the science service was initially included free of charge in the regular DEPTHnews Asia package, publishers and editors took it for granted that the service was a bonus. An informal market poll undertaken by Mr Laing, in which he asked editors outright "How much can you pay for this service?", brought "only groans and tales of economic woes and cutbacks."

Still, Mr Laing feels that the strength of the service is evident in the widespread and frequent use made of the science stories. In a hardnosed and market-oriented press where "brief is better", science features of 1000-1500 words — usually considered more suitable for a magazine format — regularly "got ink". One outstanding example was a 3000-word state-of-the-art story on leprosy that was printed by a Manila, Philippines, evening tabloid. It covered three newspaper pages! The science stories got wide distribution as material printed by the larger subscribers was picked up and republished by smaller regional papers. Because of this sort of news pyramid, science and development news was able to reach across

national boundaries and into smaller urban centres and rural areas that might otherwise never be able to obtain it.

And was it read? In journalism you never know, Mr Laing said, until you stop providing a service and disgruntled subscribers begin to clamor after it. He did feel that an additional or follow-up evaluation focused specifically on the "news consumers" and on what effect the service had on science and development awareness in Asia would be worthwhile. Other media, such as radio, which reaches the masses through the everpresent transistor set, might be more effective in delivering news to populations with low literacy levels. But radio is bound by specifics of time and space — a radio program cannot be stopped to review the difficult parts, or saved for later reference. The written word is the cheapest, most durable, and most accessible medium of indirect communication. And as literacy grows — virtually every national development campaign has mass literacy as one of its goals — the demand for relevant reading matter grows with it.

The newspaper is very much alive and well in Asia.

Science writing is showing signs of life, too. Mr Laing was instrumental in helping establish the Asian Science Writer's Association (ASWA), to which IDRC contributed an initial start-up grant. A number of professional and academic organizations in Asia now offer prizes for science writing. Although cash and recognition are favourites with any journalist, the network of peers and editors that is developing to give Asian science writers feedback and critical reviews of their work is an important strengthening agent as well. DEPTHnews Asia Science Service continues under the guidance of a young Filipino editor, Paul Icamina.

In the search for "all the news that's fit to print" journalists in Asia are discovering that when it comes to science and technology, everything from reincarnation to electric cars, fits. □

Countdown to UNCSTD

Jean-Marc Fleury

With the approach of the United Nations Conference on Science and Technology for Development (UNCSTD), to be held next August in Vienna, preparatory activities around the world have been stepped up. First, each country submitted a national paper on science and technology to the UNCSTD secretariat in New York. Then, a number of national and regional meetings — with more coming — were held on themes closely related to the conference. This year started with a round of international preliminary conferences in which IDRC played an active role, providing speakers and participants. Jean-Marc Fleury sketches an overview of these pre-UNCSTD discussions, providing a quick guide to some of the issues that will be raised later this year in Vienna.

Jamaica

Thirty notables from the South (developing countries) and the North (developed countries), some representing transnational corporations, others governments, met in Ocho Rios, Jamaica, in the second week of January. At the invitation of Barbara Ward (Lady Jackson), President of the International Institute for Environment and Development (IIED), they gathered to discuss "Mobilizing Technology for World Development". Ivan Head, President of the IDRC, co-chaired this very selective summit.

One of the most striking and unexpected conclusions of the Jamaica Symposium was the revelation that some 90 to 95 percent of the knowledge needed by the Third World to develop useful technologies is actually free and already within the public domain. Participants felt more emphasis should therefore be put on the dissemination of this information, now mainly stored in university libraries.

Nevertheless, straightforward transfer of knowledge and technology cannot be the solution to development problems; each country must develop strong science and technology (S&T) capabilities in order to choose and adapt imported technologies to national contexts. The symposium underlined the urgency of reinforcing local scientific and technological bases that would provide developing countries with a greater bargaining power in negotiating technology transfers. Even transnational corporations would benefit from this strength because they would have access to a larger number of trained people essential to the successful launching and continuation of joint ventures.

It was also obvious to the participants at the Ocho Rios meeting that the solution to many global problems in the fields of energy, raw materials, and climate demand the full participation of all of the world's countries, and thus require that developing countries increase their scientific and technical potential. Among the means suggested to facilitate the growth of local scientific and technical resources, they recommended that governments and donor agencies devote a larger share of their budgets to the support of scientific research in the Third World. They also proposed the establishment of a greater number of international research institutes such as the International Rice Research Institute (IRRI), in the Philippines, and the International Maize and Wheat Improvement Centre (CIMMYT), in Mexico. They further recommended that transnational corporations stress the training of local technical personnel.

According to the symposium's final report, the sums spent on research and development (R&D) in developing countries "should ideally be increased to as much as 25 percent by the year 2000". Presently, only about four percent of the total worldwide R&D expenditures are made in developing countries.

Tallinn (USSR)

While the Jamaica meeting was in progress, about 80 people, most of them from the Soviet Union scientific community, met in Tallinn on the shores of the Baltic Sea.

Although the problems of developing countries were not neglected, the Tallinn Symposium emphasized problems affecting all of mankind. A distinction was made between common and global problems. Common problems, like urbanization, provision of health services, and conservation of water resources, exist almost everywhere, but each country must find solutions adapted to its own physical and cultural conditions.

On the other hand, global problems such as arms limitations, sharing ocean resources, and climatic fluctuations affect humanity as a whole and cannot be definitely

solved by one country alone or a small group of countries. Their solution calls for international coordination and action. For example, the increase in atmospheric carbon dioxide, an extremely complex problem, threatens all of humanity. If this increase brings about a warming-up of the atmosphere, climate everywhere will be greatly modified and developing countries will be among those most affected. The problem, with its repercussions for the ecology, climate, and availability of energy, requires the genuine collaboration of scientists from all disciplines, in all parts of the world. It also requires immediate action. The final Tallinn report therefore strongly recommended the establishment of many interdisciplinary research institutions along the lines of the International Institute for Applied Systems Analysis (IIASA), based in Austria. It also recommended greater international cooperation between scientists of all countries. Such cooperation requires strengthening R&D capabilities in developing countries.

The Tallinn Symposium in fact provided an opportunity to study the fourth item on the proposed UNCSTD agenda — science and technology for the future. According to Dr Louis Berlinguet, Senior Vice-President of IDRC who had been invited to Tallinn in his role of Vice-President of the UN Advisory Committee on the Application of Science and Technology to Development (ACAST), the Soviet authorities, by organizing the Tallinn meeting, have clearly demonstrated their interest in UNCSTD.

Singapore

Among the preliminary international conferences held last January, the International Symposium on Science and Technology for Development (ISSTD), held in Singapore from January 22 to 26, is the one most likely to be remembered by history. In fact, for the first time ever, some 19 of the most important of the world's scientific organizations met to plan a concerted attack on under-development. The scientists admitted that development had not until now drawn the attention of a sufficient number of them. As the Declaration of ISSTD points out, half of today's scientists — who make up 90 percent of all the scientists who have ever lived — are involved in the continuing arms race.

The Singapore Symposium was, above all, a recognition of the responsibilities of scientists toward the 800 million deprived of the Earth, literally left aside by technological progress. Never before had such a meeting committed itself to work for the inclusion of a "New International Scientific Order" in the proposed "New International Economic Order".

Specifically, the Singapore Declaration gave great importance to a massive development of technology institutes in the Third World to train specialized technicians. It also stressed the need "for some of the developed countries to create and fund national, but internationally oriented, bodies to undertake research on the whole spectrum of development problems, similar to organizations already operating in Canada, Sweden, and some other countries". There was a consensus on the importance of providing means by which "an aptitude for science and engineering could be inculcated and nurtured in the young throughout the developing world, and how awareness of scientific promise and national needs could be cultivated". The assembly also suggested that transnationals should be encouraged to operate apprenticeship schemes in modern technology in countries where they operate.

The symposium looked at ways of implementing its recommendations. The creation of a special fund, the "Science and Technology for Development Fund", was proposed to finance the work of a small group whose first

task would be to draw up a list of scientific priorities in developing countries. The fund would then contribute to the establishment of a network of international centres focused on developing-country problem areas.

The scientists gathered in Singapore expressed their concern that the lack of active involvement of scientists in development planning and overall implementation of policies had contributed, in part, "to the limited success of two international development decades". The Singapore Declaration expresses the wish that, in the future, scientists become more involved in the search for solutions to development problems. "We must find the solutions," states the Declaration.

The three solitudes

Politicians, scientists, and activists from NGOs are all interested parties in the upcoming UNCSTD. Last January, they all met to discuss the Conference's agenda, "but in three different places", as Dr Karim Ahmed, Chairman of the United Nations NGO Committee on UNCSTD, pointed out during a two-day NGO Symposium in New York, January 24 and 25. The scientists were in Singapore, the delegates from governments were at the United Nations, and the members of private organizations were meeting on the far side of 1st Avenue in New York, opposite the United Nations Secretariat Building.

The NGO Symposium, "Technological Alternatives for Third World Countries", lasted only two days. It was part of a larger program that included a plenary session and a series of briefings on the NGOs' participation in the Vienna conference. As expected, "technological alternatives" was mainly interpreted as "appropriate technology" or "AT", as those in-the-know call it.

Well known among people in favour of less complex, less costly, and more easily manageable techniques, William Ellis, Secretary-General of the Transnational Network for Appropriate/Alternative Technologies (TRANET), put on trial those technologies that grew out of the industrial revolution and made industrialized societies what they are today. These technologies are alienating people in the Western world, and at the same time, are not succeeding in improving the well-being of people in Third World rural areas, said Mr Ellis. He said that on a recent tour of AT groups in the USA, he saw techniques that could easily be used in developing countries. "ATs from industrialized countries and developing countries are both perfectly compatible", he said, emphasizing the urgency of an international exchange of ideas.

Not only can AT solve a great number of problems in a more humane way, added Peter Gillingham, President of Intermediate Technology Inc., of Menlo Park, California, but its adoption could realize one of mankind's oldest dreams "that there lies within people themselves more capabilities". Because AT puts technological and scientific creativity within the reach of more individuals, said Gillingham, it would then free their creative potential: "In a word, each and everyone could reinvent the wheel on their own."

The "UN city" in Vienna where UNCSTD will be held in August, 1979.



Professor H.Y. Kayumbo, Director-General of the Tanzania National Scientific Research Council, confirmed his country's interest in appropriate technology. "In our country of 17 million people, of whom 92 percent live in rural areas, we aimed our first two development plans at large-scale industrialization. But today, we have to admit that we still import most of our manufactured goods." From now on, said Prof. Kayumbo, Tanzania is going to stress small-scale industrialization, mainly small agro-industrial complexes centred on clothing and food processing. Appropriate technologies are quite popular in the country, and 120 villages already obtain some of their energy from windmills. Regrouping most of the rural population in 8000 villages facilitated the installation of biogas plants. And the government has decided that mini-hydroelectric turbines would be installed in every village situated near a suitable stream. Funds have been earmarked in village budgets for the improvement of technologies through the participation of local people. "But," said Prof Kayumbo, "the results are slow to materialize because people have been used in the past to wait for government initiatives".

Three speakers from India gave the audience — the majority of whom were sympathetic to AT concepts — a cold shower. The first was Dr Rashmi Mayur, Director of the Urban Development Institute, Bombay, who said he did not care whether the technology was "appropriate" or "classical". "All the Third World needs," he said, "is relevant technology". Dr Mayur admitted that in his country, classical s&t mainly served the affluent: "There are many industries in the poor quarters of Bombay, but they produce for the rich". The kind of industrialization process that occurred in India has directed more than 80 percent of the investments to towns where most new industries have been created, said Dr Mayur. And towns will continue to grow and develop, he added. "At the end of this century, 35 percent of India's population will live in cities. Nobody will be able to stop this influx of people into the urban centres. At most, it could be slightly slowed down."

In order to break out of this "schizophrenic world" with rural people on one side and city dwellers on the other,

Bombay has implemented a new regional development plan. Three cities and 300 villages have been annexed to the larger industrial centre, creating a new rural-urban (rurban) entity. This, says Dr Mayur, should make it easier to move jobs outside the city, for example, with the objective being to displace 75 000 jobs over the next three years. Wastewater from the city will also be returned inland to fertilize fields instead of polluting the coastline. A pilot composting plant will soon transform city wastes into fertilizer, although the price of the compost is expected to exceed that of standard fertilizer in the beginning. Also, a university for women will initiate a series of studies of the impact of new technologies on women. Certainly, appropriate technology can be useful. In the villages, people will be closely involved with the improvement of technologies, but appropriate technology cannot be the sole answer, simply because of the magnitude of urban problems, warned Dr Mayur. "And it is in the cities that the poorest of the poor live", concluded the scientist, taking aim at some aid agencies who are presently directing their financial assistance almost exclusively to rural development and basic needs.

Jairam Ramesh, Staff Economist with the International Institute for Environment and Development (IIED), rapidly sketched the evolution of science policies for development during the last 30 years. First, said Mr Ramesh, developing countries tried to follow the same pattern of development that emerged in industrialized countries, and put all their expectations in overall industrialization. Then, he said, they tried to fight against the technological domination that could result from the direct transfer of technology, and cited the struggle of the Andean Pact countries as an example.

"The paradigm nowadays is appropriate technology for the rural poor." During this change in policy some general principles nevertheless emerged to be generally accepted by the experts, added Mr Ramesh. The importance of involving people in the planning and implementation of new technologies was one that received recognition. Planners and decision-makers also realized that there was no substitute for local experience. The "trickle down theory", according to which investments made in the top income sectors would ultimately filter down to benefit the lower income groups, was definitively rejected. Preference now goes to projects having immediate and concrete results, while at the same time, government leaders are giving more importance to national science and technology policies.

Mr Ramesh went on to predict that the 1980s would see the beginning of a wider s&t gap between the South and the North with the coming of a new industrial revolution, this time based on computers and telecommunications (tele-matics). Only countries like India, South Korea, Brazil, Mexico, and a few others stand some chance because they managed to build a sophisticated s&t base. This trend, said Mr Ramesh, confirms that India, for example, made a sound decision in building its s&t capabilities. It should be careful not to neglect them because appropriate technology has become fashionable, he added.

Near the end of the symposium, Dr M.G.K. Menon, Secretary of India's Ministry of Science and Technology and recently appointed Chairman of the Preparatory Committee for UNCSTD, repeated the broad outlines of a speech he had given the previous evening at the United Nations. He hailed the progress his country has made in the field of s&t, while admitting that internal economic disparities had widened. "The green revolution helped feed more people", he said, "but it made the already rich, richer". Even AT can introduce negative social distortions, continued Dr Menon, giving the example of biogas plants. "In India, cow dung is a primary source of energy: poor people use it to cook their food, destroying in the process an important source of fertilizer.

The problem is that biogas generators need a constant supply of cow dung and this product is now more inaccessible to the poor." The Chairman of UNCSTD's Preparatory Committee criticized those who think that developing countries should be satisfied with outdated secondhand technology. "Appropriate technology should not mean simple technology", added Dr Menon. "Developing countries need advanced technology." He cited the case of solar energy, presented as the ultimate solution to energy problems in the tropics. It is impossible to rely on the sun because of the disruptions of the monsoons, he said. "What we need, therefore, is a mix of technologies."

Finally, to the participants' great satisfaction, Dr Armando Caceres, Coordinator of the Rural Health Project of the Centre for Latin American Studies on Appropriate Technology, Guatemala, ended the symposium with a series of examples confirming the usefulness of AT. He described a baked earth oven that could reduce the consumption of firewood by 40 percent, and a local volcanic ash that could be used instead of imported cement to build houses. He showed how his group is training health "promoters", barefoot doctors knowledgeable in the use of medicinal plants and acupuncture. Dr Caceres also described a series of projects on the improvement of latrines as low-cost waste disposal alternatives, some of which are being supported by the IDRC. All these projects demonstrate that the local population can participate in technical improvements through appropriate technology.

What do these meetings augur for the Vienna Conference? Not much can be said at this time, as those who are expected to be the main actors at UNCSTD, the Group of 77, have not yet announced their positions. Not until the developing countries have agreed on some common position, as they plan to do, will it be possible to predict with any certainty the main issues of the Conference. However, one thing is sure: in many of these preliminary conferences there has been a kind of consensus on the need to create more organizations to strengthen and support scientific and technological research for development. The IDRC is regularly cited as an example of this type of organization. Such a proposition was included in the NGO Report for UNCSTD; participants in the Jamaican Symposium asked for the creation of more development research centres; and according to Dr Louis Berlinguet, the IDRC was often mentioned at the Singapore International Symposium.

Viewpoint

Readers' comments on articles appearing in The IDRC Reports are welcomed. All correspondence should be addressed to the Editor, The IDRC Reports, P.O. Box 8500, Ottawa, Ontario, Canada K1G 3H9

I have read with great interest the letter from Dr C.W.L. Jeanes of CIDA (Reports Vol. 7 No. 4) in response to the article "Vietnam fights a different war." However, I must point out that there seems to be a misunderstanding. Dr Jeanes has commented that the information given in the article about BCG was incorrect and that the suggestion that placental extracts were effective in treating tuberculosis is absolute nonsense. However, Dr Jeanes is clearly talking about efforts made in South Vietnam while my article specifically refers to what was then North Vietnam. Since the publication of my article, Dr Hoang Dinh Cau, Vietnam's Vice-Minister of Health, has confirmed in a personal communication that BCG killed at 43° centigrade, and placental extracts to boost the effectiveness of INH, were widely used during Vietnam's war period.

Vietnam is now increasingly substituting 43 °C BCG vaccine with the conventional live BCG vaccine. This is because 43 °C BCG required repeat vaccination every year, and conditions for storage of live BCG vaccine have now considerably improved.

The use of biostimulines to boost the effectiveness of INH continues to attract the interest of physiologists in Vietnam. Biostimulines are prepared from organs of big animals (brain and liver of oxen) or from human placenta taken in aseptic conditions. Vietnamese physiologists believe that they lower the acetylation of INH, which increases the active INH concentration in blood and thereby its antibacterial efficacy. Biostimulines are rich in amino acids and thus also seem to have a roborant effect on the patient.

However, the most important thing about these innovations is not that they are as good or better than practices commonly used in other countries, but that they greatly helped North Vietnam to become self-reliant during very difficult years.

Anil Kumar Agarwal
Earthscan,
London, England

BRIEFS

CENTRE ENERGY TASK FORCE FORMED

Biomass, biogas and pump-windmill systems: these are only three renewable sources of energy that will be examined by IDRC's recently created renewable energy task force.

The three-man task force has been created to provide IDRC with renewable energy information gathered elsewhere, while at the same time making information available to others involved in this field. It will also coordinate the efforts of the Centre's program divisions, bringing already existing material together in one place.

The members of the task force are: John Bene, Senior Advisor to the President, who will continue the work on energy from biomass he has been involved in for a number of years; David Henry, former Assistant Director of the Health Sciences Division, who will work specifically on pumping systems; and Michel Houde, an engineer, who will evaluate technical applications.

"Almost all problems need an interdisciplinary approach to solve them and energy is no exception," says Mr Bene. "It seems to be related to everything. This is why all divisions will be involved. We also wish to assure cooperation and interplay with other Canadian organizations involved in renewable energy. These include the National Research Council, Energy Mines and Resources, Brace Research Institute near Montreal, and perhaps the Canadian International Development Agency, which is considering becoming involved in renewables."

FISH FRY CHANGE SEX FOR FOOD

A new technique of "persuading" fish to change their sex may create quite a splash for fish farming for food in Africa and Asia.

A research team at Stirling University in Scotland, in collaboration with scientists in Kenya and Malaysia, were able to manipulate the sex of the popular fish species tilapia to produce only male fish.

Breeding stunts the growth of female tilapia; and they often begin breeding at eight weeks, when they are only a few inches long. In effect, because female growth almost stops at an early

age, little harvestable protein is produced, and the females become easy prey for larger fish and birds. By comparison, male tilapia can grow to weigh 2 kilograms within a year.

Researchers set out to breed only males, and turned their attention to tilapia fry — an early stage in the fish life cycle, before sex is fixed. They discovered that by adding small amounts of male hormone to tanks containing newly hatched fry, only males develop.

According to a report in *New Scientist* magazine, Dr Ronald Roberts, director of Stirling University's aquatic pathobiology unit feels that "fully developed, the system would be capable of producing many thousands of tons of food a year. It has massive potential." The next stage of experimentation will involve repeating the technique on a larger scale, closer to the size of actual fish farming operations.

GOITRE PREVENTION SIMPLE

Iodine deficiencies causing goitre pose a more serious nutrition problem in the Philippines than lack of protein, according to a member of the University of the Philippines College of Medicine.

"The whole country has the problem," said Dr Paulo C. Campos, citing incidence rates of goiter approaching 70-90 percent in residents of mountainous areas, and as high as 50-70 percent in other regions of the Philippines.

Yet prevention may be as simple as drinking a glass of seawater a day to obtain the necessary dietary iodine supplement. Unfortunately most people are unaware, or simply do not care about the iodine value of their food, said Dr Campos, with the result that goitre cases have risen in alarming numbers.

Iodine is an essential ingredient of thyroid hormones produced by the thyroid gland located below the larynx at the base of the neck. When the body is iodine-deficient the glands increase in size in order to absorb more iodine from the bloodstream. The increased size appears as a goiter, an abnormal neck bulge or swelling in the front of the neck. As thyroid hormones govern the body's metabolic rate, goiter or thyroid deficiencies can produce cretinism (retarded mental and physical growth) in children, and hyperactivity or lethargy and associated problems in adults.

Dr Campos, who recently completed a study on goiter prevalence in five communities southeast of Manila, found that injections of iodized poppyseed oil provided an effective treatment, although expensive and difficult to administer. He suggested less expensive and more practical methods for mass treatment in the Philippines — besides a daily glass of seawater — might be iodization of drinking water supplies, encouraging greater use of iodine supplements to consumer food products such as fish or soft drinks, and the addition of iodine to salt beds to ensure a supply of iodized salt.

MUD MASONRY MASTERED

Scientists in Devon, England, have been playing in the mud and have come up with a new, economical building material. Of course, mud houses have been giving shelter to families since history began, but they dissolve under heavy rains. The researchers at Bicton Agricultural College have perfected a method of binding mud bricks together and waterproofing them by coating the bricks with a glass-reinforced cement.

The walls of the mud house are laid in a traditional brick-laying pattern, but without mortar. The cement coating is then applied to both sides of the wall and on top of it, making it absolutely rigid and waterproof. The difficulty is that the bricks must not be allowed to get wet before they are coated and must be protected during building.

But it is worth it. The material cost of a wall of mudbricks is about US\$4.50 a square metre, less than half the cost of a wall built of conventional bricks. The building material can also be excavated and prepared on the building site, saving transportation costs.

JUST A SPOONFUL OF SUGAR ...

Optimism is growing among scientists in Reading, England, and Edinburgh, Scotland, over a novel nonhormonal male contraceptive agent that has proven completely effective in animals, and lacking any deleterious side effects. The compounds are chlorinated sugars — substances closely related to ordinary sugar with one atom of chlorine in a molecule. Small oral doses completely inhibit fertility in animals without affecting libido or the production of spermatozoa.

The research was initiated by the Department of Physiology and Biochemistry at Reading University in 1976, and quickly support-

ed by the World Health Organization (WHO). The sugar firm of Tate and Lyle, which has a research laboratory on the university campus, collaborated in the project.

It is thought that chlorinated sugars reduce the ability of spermatozoa to convert glucose into the energy needed between ejaculation and fertilization. Put simply, the sperm cells die of exhaustion before they reach their goal, reports *The Scotsman* newspaper. Infertility in animals is produced in about a week, with fertility returning a week after administration of the sugars ends.

Work in Edinburgh, being carried out at the Medical Research Council's reproductive biology unit, is centering on tests with marmosets and is reported to be at an advanced stage. The sugar firm has applied for a patent on the material, which could easily and cheaply be put into large-scale commercial production. The researchers, however, stress the need for continued exhaustive testing and warn that many more years of clinical trials will be needed before the compounds become available.

POPULATION BOMB DEFUSED?

The much-predicted "population doomsday" seems to have been postponed, if not definitely canceled, reports the Population Reference Bureau. According to a calculation in a recent *Population Bulletin*, traditionally high fertility rates in most developing countries declined between 1970 and 1975. At the same time, mortality declines leveled off. This means that the huge demographic gaps built up between births and deaths in the Third World after World War II — the cause of the population explosion — are now narrowing.

If this keeps up, it is calculated that "as of the year 2000, less than a fifth of the world's population will be in the red danger circle of explosive population growth — 2.1 percent or more annually. Most of the less developed countries will then be in a phase of fertility decline, and many of them, along with most of the now-developed countries, will be at or near replacement level fertility." The new predictions put the world's population at 5.8 billion in the year 2000, half a billion less than a United Nations estimate made in 1973, and 200 million less than the current World Bank estimate.

The report warns, however, that "our optimistic predictions are premised on a big if — if family planning continues in less developed countries."

Commentary

“We have forgotten the people”

Kenneth King

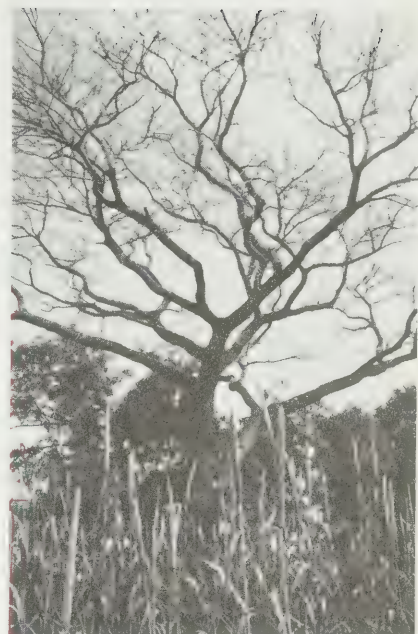


Photo: Neill McKee

The title of the paper on the agenda was “Some aspects of land-use planning”. But if the delegates to the Eighth World Forestry Congress in Jakarta, Indonesia, were expecting an uneventful address on a familiar topic, they were due for a rapid awakening. Dr Kenneth King, Director-General of the International Council for Research in Agroforestry (ICRAF), used his subject as a base from which to explore many of the causes of underdevelopment. And as the following extracts show, he included his own colleagues among the culprits.

Dr King started his career as a forest ranger in his native Guyana, rose to become that country’s Minister of Economic Development, and most recently was Assistant Director-General and head of the Forestry Department at the UN Food and Agriculture Organization (FAO). Copies of the full text of his address are obtainable from ICRAF, PO Box 30677, Nairobi, Kenya.

The prophets of doom, the harbingers of pessimism and gloom, are all around us. We are told that there are limits to growth. We are lectured on the finite nature of the world’s natural resources. Many advocate what, in their own words, is a return to primitivism. And these and others openly spurn and scorn the advances of modern science.

If the developing countries reject the technological and scientific progress that has been made throughout the centuries, if they ignore the body of knowledge that has been gleaned over the years, their peoples will be condemned to a life which, in the words of Hobbes, will be “nasty, brutish, and short”.

I suggest that science and economics, specifically with respect to the use of land, are not the villains of the piece, are not the causes of the catastrophes that have fallen upon us in recent years. It is our failure to apply scientific approaches to land-use, and our failure to adapt the principles of science to specific conditions that have led to the many cases of soil degradation, erosion, floods, and droughts, and to the concomitant human distresses: the poverty, the malnourishment, the half-lives, the early deaths.

It is not that the principles and methods of economics have little or no relevance to land-use planning, to the allocation of the various factors of production. It is that we have erred in the application of those principles, we have not truly understood how to apply those principles to the particular sociopolitical philosophy that the government of this or that country follows. And we have not fully grasped the importance of adapting our knowledge to the specific sociopolitical stage of the evolutionary process of the particu-

lar country for which we purport to plan.

We have tended to ignore the human dimension. We have, more often than not, forgotten the people.

In land-use planning we must relate our scientific knowledge to the specific conditions of the area for which we plan. This is obvious, but this elementary principle is not always followed. We must also adapt the principles of economics to the evolutionary stage, and to the political philosophies of the peoples and governments for whom we plan. This too, should be obvious, but seldom seems to be appreciated.

Above all, we should take account of the sociological factors of the societies for whom we work: we should study the societies, analyze the practices and customs of the people for whom we plan, attempt to appreciate their responses to different types of stimuli, try to understand their hopes and aspirations, fathom what motivates them or acts as a disincentive — and then adapt our plans to these human considerations.

It is important at the outset to distinguish between land capability classifications and land-use plans. They are different, though complementary, processes. Land classification is the foundation on which good land-use planning rests. It indicates, in an easily understandable manner, the potential of the land, and it categorizes the differences between different areas of land. To this background of information, the planner should add his knowledge of the economic, legal, social, and institutional factors that affect land-use and that are germane to decision-making. From this synthesis a land-use plan may be born.

I turn now to the planning stage of the exercise. We will assume that the

land has been properly classified, and that what is now required is a scheme for achieving a desired objective through the utilization of the land. There are now two basic considerations: the objective of the plan, and the way in which the objective is to be achieved.

Deciding on the objective is one of the most important aspects of land-use planning, indeed of any kind of planning, and the correct choice is not as easy as it appears is generally assumed. The objective will depend upon a mix of factors, some political, some social, some economic, and some physical. Moreover, the weight to be given to these factors will vary in time and place. Nevertheless, it is essential that certain information be collected and analyzed for there to be some basis for deciding on the objectives. These data and information will assist the decision-makers in choosing the objective of the plan, which will undoubtedly be influenced by the political ideology of the government concerned, and by the stage of the country's development. In spite of this complexity, certain guidelines have been put forward.

It does seem to me, however, that two objectives of land-use plans that might be pursued by almost all developing countries — to the benefit of their rural poor and of their general economies — are the attainment of an equitable distribution of income among the population, and the achievement of an equitable distribution of economic activity in the various countries for which the plan is being formulated.

I have not been able to find these objectives in the relevant literature. This is perhaps not surprising, because planning and directing the use of land in order to achieve a measure of social justice is often anathema to the ruling elite of the developing countries, and, perhaps more important, is frequently unacceptable to, and beyond the economic comprehension of, those international experts who advise the developing countries on these matters.

The doctrine of economic growth was until recently a sacrosanct concept blindly followed by most planners. It was believed that if development projects that yielded acceptable profits were implemented, the profits could be used for further development, and the benefits of these several projects would "trickle down" to the poorest of the poor. They would receive employment, their standards of living would rise, and the State would be in a better position to provide them with educational and health facilities and all the social and physical infrastructure that is considered basic in the modern world.

Unfortunately, it did not work in many countries. The rich became richer and the poor got poorer. It therefore behooves us to attempt to redress the balance in all our economic activities. One way to do this is by directing our land-use to these specific objectives.

It must be admitted, however, that sometimes the projects that attain these social benefits yield relatively low or even marginal rates of economic return. Now a society cannot meet the increasing demands of growing populations for all their developmental needs if it has to depend, in aggregate and continuously, on projects that yield minimal returns. It is therefore essential that the mix of projects in the economy as a whole yields rates of return that will permit further investment. Land-use plans should not be formulated in a vacuum. They should form part of the general development plan. It obviously follows that forest policies and forestry plans and projects should also be conceived as an integral part of national development plans.

Foresters have for centuries been so obsessed with, and mesmerized by, the wood they produce, that they generally do not consciously manage their forests for other tangible, saleable benefits. However, the forest ecosystem contains and produces a not inconsiderable number of goods other than wood that can be commercially exploited. These are normally described by foresters as "minor" forest products. The terminology employed by the forestry profession is indicative of the slight regard it holds for these types of products. Yet it can be demonstrated that in many cases the financial yields that may be obtained from nontraditional products of the forest ecosystem exceed those to be gained from the traditional. Moreover, these returns are normally obtained in shorter periods than those gained through exploiting forest plantations for wood only.

I therefore urge that the total productivity of the forest ecosystem, whether natural or artificial, be considered in planning the use of land for forestry: that in establishing forest plantations, species capable of yielding other products (for example, leaves for food and fodder, fruit, resins, gums) in addition to wood be chosen; that in the establishment of forest plantations the land be utilized for the production of agricultural and forest crops; and that in managing the natural forests, all the bounty of the forest ecosystem be taken into account.

Many of the forest reserves that exist today were established without benefit of land capability classification and land-use plans. These blanket reservations cannot therefore, in a world of want, in a world of hunger, all be considered sacrosanct and inviolable. The landless citizen should be permitted to farm in them on those sites which are suitable for arable agriculture. There must be safeguards, there must be protection of the forest estate, but the objective of these should be developmental, not restrictive; positive not negative.

Forest services should be restructured to permit the optimum development

of forest resources. Moreover, it should be recognized that these resources cannot be fully developed if forest services are staffed only by foresters. The efficient utilization of forest resources demands a multidisciplinary team. Other scientists, and economists and managers, must therefore be included.

Forest officers should communicate more with rural inhabitants, even those who live and work outside the forest reserves. The benefits and practices of forestry should be imparted to them, and extension arms of the forest services established to assist the rural poor to grow trees for fuel, for food, for fodder, and for wood for shelter.

Finally, services should be geared to exploit, in a sustained manner, the total ecosystem. Concentration on one type of forest product is a waste of resources that our countries cannot afford.

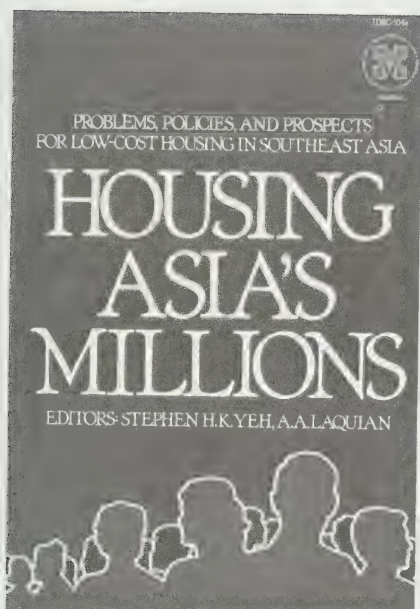
It follows from all this that the forest policies of most countries will have to be revised, their forest laws made developmental and not prohibitive, and their forest rules and procedures drastically altered.

We live in a world in which there is an almost incessant wailing and gnashing of teeth. Man's positive influence on his environment is now almost never acknowledged. It is interpreted almost entirely in terms of resource depletion, population explosion, and ecosystem degradation. The mood of our times is almost invariably pessimistic, and almost invariably antihumanistic. On the pretext of wishing to help humanity, the purveyors of despondency formulate policies that are often contemptuous of mankind.

The population of the world is increasing, and there is great malnourishment. But it is not true that there are insufficient resources on our planet to feed the hungry, and to develop the faculties of the indigent and the disadvantaged. It is not true that the basic crises of our time are caused by the fecundity of the poor of the developing world, whose very right to exist and to procreate is challenged even by "liberal" Northerners. I suggest that the solution to what is one of the basic problems of our age is not to be found in the alarmist philosophies and prescriptions of those who often seek a transient popularity. Indeed, there is no one solution.

I am of the opinion, however, that there are two prerequisites. The first essential requirement is that we must understand and appreciate that all economic activity should be undertaken with the welfare of people uppermost in our minds. The second is the formulation and implementation of rational programs of resource allocation. Land is one such resource. Indeed, for most of the people of the world it is the most important resource. It is therefore incumbent upon us to use it wisely. □

New publications



Housing Asia's millions: problems, policies, and prospects for low-cost housing in Southeast Asia, Stephen H.K. Yeh and A.A. Laquian, editors. Published in March 1979, 244 pages, IDRC-104e.

This publication is the comparative analysis of the Southeast Asia Low-Cost Housing project, an eight-country study of land provision and policies, housing design, administration, finance, urban and regional planning, and the problems posed by squatters and slum dwellers in providing low-cost housing. This volume discusses the objectives and methodology of the different country studies, compares their approaches and analyzes their successes and failures, and is intended as a companion piece to them.

Coffee pulp: composition, technology, and utilization, J.E. Braham and R. Bresnani, editors. Published in March 1979, IDRC-108e.

This publication gathers together some of the studies undertaken in conjunction with an IDRC-supported project on the chemical, biological, and technological characteristics of coffee pulp as animal feed. The study reviews the advances made in research on this by-product, points out ways of utilizing coffee pulp, problems and constraints to further use, and discusses areas requiring further research. Aspects of preservation, processing, and chemical and physiological suitability as animal feed are discussed: a bibliography and statistical data are included.

Devindex 1977: Index to 1977 literature on economic and social development produced in Canada and the Federal Republic of Germany, Gisèle Morin-Labatut, editor. Published in February 1979, 200 pages, IDRC-119e.f.

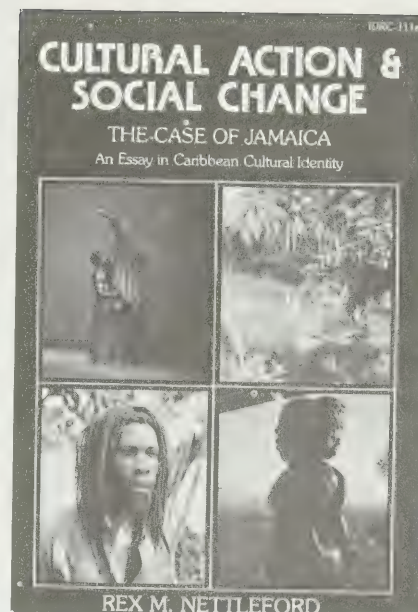
This third issue of Devindex makes two departures from the earlier indexes. In addition to Canadian material, the annotated bibliography contains references to material on economic and social development in the Third World published in the Federal Republic of Germany in 1977. It also represents the first attempt to test DEVSIS (International Information System for the Development Sciences) methodologies in a computerized system.

Sorghum and millet: food production and use, Sally Vogel and Michael Graham, editors. Published in March 1979, 64 pages, IDRC-123e.

This is the report of an IDRC-sponsored workshop on sorghum and millet production and processing, held in Nairobi, Kenya, 4-7 July 1978. The papers presented at the workshop have been combined in order to give an overview of sorghum and millet use, particularly in Nigeria, India, and East Africa. Harvesting, drying, storing, milling, food preparation, and consumer acceptance testing are discussed: the publication includes recipes and sample consumer questionnaires.

Low-cost rural health care and health manpower training: an annotated bibliography with special emphasis on developing countries, volume 4, compiled by Frances M. Delaney. Published in March 1979, 186 pages, IDRC-125e.

This is the fourth volume of a series of bibliographies that attempts to coordinate information, both published and unpublished, on nontraditional health care delivery systems. The focus in the current volume continues to be on new models of health care delivery and the training and utilization of health workers: it contains 700 references, separately indexed by subject, by author or institution, and by geographical location.



Cultural action and social change: the case of Jamaica; an essay in Caribbean cultural identity, Rex Nettleford. Published in March 1979, 239 pages, IDRC-111e.

Focussing particularly on Jamaica, this publication deals with the cultural heritage and the cultural factors of social change in the Caribbean. It discusses the dilemma of cultural diversity and national unity, the legacy of slavery and colonialism, and the role of the arts and mass media in national development. The author is a member of IDRC's Board of Governors, and one of the foremost figures of the Caribbean cultural scene, serving in national and international cultural bodies, and as artistic director, chief choreographer, and dancer in the National Dance Theatre Company of Jamaica.

International Development Research Centre Projects 1970 — 1978, compiled by Rowan Shirkie. Published in March 1979, 92 pages, IDRC-122e.

Listing all IDRC-supported projects from the Centre's inception in 1970 to the end of 1978, this publication is an introduction to the range of development research administered by the Centre. Over 800 projects are briefly described, including information on recipient organizations, funding, and duration of research: an extensive subject index and a country index are included. (Also available in French and Spanish.)

For information on these and other IDRC publications, see announcement on the back cover of this issue.

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In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related activities. A catalogue of currently available material is available on request.

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The IDRC

Reports

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DOSSIER:
LATIN AMERICA & THE CARIBBEAN

Cover photo: Jaime Rojas. A market in Caqueza, Colombia, is a profusion of colours, shapes, and textures. The same diversity is reflected in the region as a whole, and development plans must be shaped accordingly. See Dossier: Latin American and the Caribbean, beginning on page 11.



The IDRC Reports, and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division.

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Contents

3 Biomass: an energy natural

Bob Stanley reports that we are only now waking up to energy's "sleeping giant".

6 Development needs energy

Rural development needs a different kind of energy, says David Henry.

7 Protein from pig wastes

Singapore turns a pollution problem into an economic advantage, by Lee Boon Yang.

9 Population message from the village

Michelle Hibler writes about the changing perception of the "population problem".

11 Dossier: Latin America and the Caribbean

The countries and the cultures of Latin America are diverse and sharply contrasting. So too are the region's development needs. The search for solutions must be adapted to each context, as the six articles in this dossier illustrate.

21 Commentary

According to M.S. Rao the world cannot conquer hunger without a coordinated food policy.

22 Canada prepares for UNCSTD

J. King Gordon attended a recent symposium in Toronto on science and development and files this account.

24 Briefs

People, projects, events

25 Climate: change is in the air

As Rowan Shirkie explains, climate is becoming a cause for global concern — and action.

27 New publications

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Biomass an energy natural

Bob Stanley



Cow dung and straw, made into cakes and dried, are a source of fuel in India: conversion of dung to biogas could produce the energy equivalent of 40 million tonnes of coal per year.

The so-called energy shortage has become perhaps the single most important factor in global affairs of the seventies. The need, or greed, for oil has tended to override established political and ideological differences, and has reshaped the world's economy in only half a decade. The true have-nots now are those with no guaranteed supply of fossil fuels — and those who can no longer afford them. The only real rich are the oil rich.

Yet the great energy crisis that began with the OPEC oil embargo in 1973 may in retrospect turn out to be one of history's black jokes. For while the poor get poorer and the rich scramble desperately in some of the most hostile environments known to mankind in search of new sources of oil, abundant supplies of energy are to be found all around us — if only we care to look.

The simple fact of the matter is that there is no energy shortage. A shortage of fossil fuels? Probably. A shortfall in distribution and delivery systems? Obviously. A lack of concern for those most in need? Debatably. A shortage of imagination? Unquestionably. But a shortage of energy? Certainly not!

The abundant, and largely ignored, source of energy that is all around us can be described in one word — biomass. Biomass is the total amount of renewable organic matter on earth. It is a small proportion of the sun's energy converted into chemical energy. It is the basis for the sustaining of all life on this planet. Biomass, in short, is the earth's total complement of plants and animals.

The potential for energy production from biomass is perhaps best illustrated by the estimate that the amount of energy stored by the total biomass system in the United States in a year is equal to that country's annual energy consumption. And the USA is the world's leading energy consumer, gobbling up an amazing six times the world average.

The needs of the United States, which consumes more energy for air-conditioning than is needed for commercial purposes in the whole of China, are very different from those of oil-poor developing countries. And it is in these countries that the potential for the development of biomass energy is greatest.

Virtually all plants, including aquatic vegetation, are potentially capable of being converted into some form of energy. The three most promising sources of plant biomass (phytomass) for energy production are trees, agricultural crops and grasses, and aquatic plants. Given the basic research to determine which plants to grow, when and where, and the most efficient methods of producing energy from the various parts of the plants, it should be possible for many developing tropical countries to grow all the energy they need.

A study carried out in Ghana by the Georgia Institute of Technology estimated that a labour-intensive "energy-food" plantation of 40 000 hectares could produce annually the energy equivalent of 450 000 tonnes of coal, plus 50 000 tonnes of corn and 55 000 tonnes of peanuts. It would also create many new jobs.

The animal kingdom is a lot less efficient in converting the sun's energy into useable form, principally because both men and beasts must first be "fuelled" with plant matter before they can work. Indeed, apart from a few relatively rare products such as fish oil and tallow, the only form of animal biomass used, or likely to be used for energy production is in the form of excrement.

This is a considerable contribution, however. It has been calculated that the dung produced annually by all the cattle in India, if converted to biogas instead of being burned, could produce the energy equivalent of about 40 million tonnes of coal per year. This is only a fraction, however, of the energy potential of the world's forests.

Tree biomass

Trees are much the most important source of biomass for energy production. Because conventional forest inventory data do not concern themselves purely with energy production, they tend to be misleading, and estimates of the energy potential of forest biomass tend to be widely divergent. However, one *conservative* estimate puts the reserve of energy held by the world's forests at about 20 times the current annual global consumption of energy from all sources. The annual rate of increment is estimated at five times the earth's hydroelectricity potential — or a little more than the total consumption of fossil fuels in the boom year of 1970.

Ironically, most of this potential source of energy is far removed from centres of population. In fact, in many areas of the developing world, where wood and charcoal still provide 85 percent of the people's fuel needs, the scarcity of fuelwood due to increasing population pressures is reaching crisis proportions. The first priority then, must be the proper management of the forest resource, in order to bring out its optimum capacity without destroying the resource base — the land itself.

Natural tropical forests often contain more than 100 species on a single hectare, only a few of which are commercially useful. The harvesting of other, underutilized species for energy could actually improve the management of the forest. Similarly, undersized trees taken to thin out industrial or "man-made" forests would be readily adaptable to energy production. Such forest plantations at present represent a small percentage of the tropical forest, but their use is increasing rapidly.

Another system that may be particularly applicable in developing countries where land and labour costs are low, and sunshine and moisture are abundant, is the use of energy plantations. Experimental tree farms for energy production exist in a number of countries, including Nigeria and Malawi. Although hard data are not yet available, the potential is tremendous, particularly if research can help develop the species and techniques for rapid growth and maximum yield.

Such plantations might also be made to produce other products, such as oils, fruit, fodder, or rubber. Another alternative is the multiple-use energy plantation, with various tree and agricultural crop combinations. Again, a good deal of research is needed to fully understand both the techniques and the economic benefits.

One technique that has yet to be studied in relation to maximizing biomass production is the systematic pruning of branches. Lopping (removing lower branches) and pollarding (removing the upper part of the tree), are both carried out for various reasons in specialized kinds of wood production. Properly carried out, they could provide yet another means of maximizing yields from energy plantations.

Forestry wastes and by-products of plantations established for other specific purposes represent still another source of biomass energy. In some countries as much as 50 percent of fuelwood supplies now come from such residues as logging and mill wastes and the by-products of rubber or coconut plantations.

Whatever the energy situation in the future, it is likely that wood will continue to be the main source of fuel for hundreds of millions of people in the developing countries. Most of the technical knowledge required to improve supply, management, and energy conversion of the tree biomass already exists. The gap is in the application of that knowledge to specific situations.

Crops and grasses

Practically all the plant biomass produced by farmers around the world is a potential source of energy, whether the crop is grown for food, feed, or fibre. A substantial portion of the planet is still covered by grasslands, only a fraction of which are grazed by domestic animals. These

too could be converted to useful energy.

Crop residues present more difficulties than do trees, however. First, energy production must compete with other uses such as fertilizer, feed, and a variety of industrial uses. Then the supply is also subject to the usual uncertainties of fluctuating demands for specific crops, and of course the weather. Nevertheless, there is considerable scope for increasing the contribution that agricultural wastes can make to the world's energy supply, particularly in the Third World.

The study in Ghana referred to earlier estimated that residues from the country's rice, coconut, and oil palm crops, combined with about the same amount of forestry wastes, could produce the energy equivalent of 1.45 million tonnes of coal — more than doubling Ghana's 1973 energy production.

Sugarcane and cassava are two of the most important major crops grown in the developing world, with a total yield, according to 1975 FAO statistics, of 645 million tonnes. Both are being used in Brazil to produce ethanol as motor fuel. According to Brazilian scientists, an energy strategy based on biomass is a natural course for Brazil with its huge land area and ideal climate for growth. It has been estimated that less than two percent of the land area could provide enough fuel to replace all imported petroleum.

Cereal or grain straws are also a potential source of fuel. Annual straw yields per hectare in the USA range from 4.5 tonnes for wheat to as high as 27 tonnes for sorghum. Also in the USA it has been estimated that grasses grown on agricultural lands have a higher potential to produce biomass than do forest lands.

Millions of hectares of uncultivated grasslands are burned every year to dispose of dry vegetation and promote new pasture growth. The practice is both destructive and wasteful, and contributes to the spread of desertification in semi-arid regions — just those regions where wood fuel is in shortest supply. Yet the warm-season grasses such as Bermuda grass and Sudan grass have as great a potential for energy plantations as the most promising tree species.

More research in the developing regions is needed to determine the real potential of grass biomass, particularly on uncultivated lands. Studies on agricultural lands in the USA suggest that 100 000 hectares of grassland could produce as much energy as a 500-megawatt power plant.

Aquatic plants

Although aquatic vegetation contributes only about one-quarter of the world's primary production of phyto-mass, the possibilities for a wide variety of uses are enormous, and largely untapped. Only very recently has some research begun into the huge potential of waterplant biomass for energy production.

Nowhere is that potential greater than in the warm waters of the tropics, where waterweeds are at their most prolific, and some species produce more biomass from a given area than any land plant. Most of the species useable for energy production are essentially a free crop — they require no seed, cultivation or fertilizer. And while in some countries aquatic plants are used to varying extents for food, feed or fertilizer, they are more commonly regarded as a nuisance, blocking waterways and even contributing to the spread of disease.

In fact, among fresh water plants the water hyacinth can contribute to health by removing pollutants from the water. Incredibly prolific in warm waters, the hyacinth grows so densely that it is possible to walk across floating masses of the plants — and they thrive on nutrients from domestic and agricultural wastes and sewage effluent. Daily yields of up to 500 kilos of dry matter per hectare have been recorded.

Egypt and Sudan have recently embarked on a dual-purpose project to keep the upper waters of the Nile clear of water hyacinths, and convert the resulting biomass harvest to methane gas by a process of fermentation. This process appears commercially promising. Harvesting is

simple, by mechanical or labour-intensive means, and each dry kilogram of water hyacinth (the freshly harvested plant is about 95 percent moisture) yields about 370 litres of biogas containing 60 to 80 percent methane. The sludge left over from the fermentation process makes a valuable fertilizer.

It may be possible to apply the same basic process to duckweeds, tiny water plants found worldwide that cluster in colonies on the surface of fresh water bodies. Having many similar properties to the water hyacinth, some species also have the advantage of a much higher dry matter content. Little research has yet been done on the biomass energy value of duckweeds, however.

Fresh water microalgæ are also very efficient at fixing solar energy, and thus have a very high reproduction rate. They also purify water, and thrive on sewage effluent. If they are to be used for biomass energy production, however, they will have to compete for the demand for use as animal feed: their protein content runs as high as 60 percent.

Their ocean-going cousins are the giant California kelp, huge marine algæ colonies that grow up to 65 metres in length. These usually do better in colder seas, although they are cultivated commercially in Japan, the Philippines, and Taiwan. The fact that some 70 percent of our planet's surface is covered by oceans means that most of the sun's energy falls on the seas. Farming the oceans for biomass is an area of research that has so far remained largely out of reach of the developing countries. It should not continue to be neglected.

Getting the energy out

The simplest and most direct method of obtaining energy from biomass is by burning it — even waterweeds can be burned if they are thoroughly dried. Burning biomass on an open fire is, however, the least efficient method of releasing this energy. Although relatively efficient compared to open combustion, the stove is still not a very good energy converter. And yet it is in precisely those areas of the world where fuel is most scarce that it is used most inefficiently.

Some plants — such as sugarcane, cassava, or waterweeds — lend themselves well to the production of gas by

fermentation. This is a relatively simple, economical process that shows great promise. The fermentation process can also be applied to cattle dung, much of which is used as fuel at present — a practice that is not only enormously wasteful, but is also harmful, as the smoke given off is damaging to the eyes.

Another promising conversion technique is pyrolysis — in which wood, or other lignocellulosic biomass, is heated in the absence of air to produce charcoal and various combustible liquids and gasses. Charcoal is a popular fuel in the developing world, and for good reason — it is lighter and easy to store, practically smokeless, and burns evenly. It is roughly four times as efficient as dry wood. Charcoal production from wood has been a common practice for hundreds of years. The technology is relatively simple and inexpensive, and can be operated on a small scale. Much of the technology now used in developing countries, however, is inefficient since it wastes the by-products of pyrolysis such as methanol and acetic acid. More efficient techniques have been developed, primarily in the USA, and developing countries could likely benefit from the new technology.

In recent years there has been a revival of interest in gasification — in which pyrolysis results in the complete conversion of wood or other biomass into a combustible gas. This gas may be converted to methane as a substitute for natural gas, or to methanol (wood alcohol), which may be used as motor fuel. While most of the research is now being carried out in the industrialized world, it may have important implications for the developing world in the not-too-distant future.

The production of biogas by fermentation of animal and vegetable wastes is a technology that has been developed in the developing countries. Only very recently have scientists in the industrialized nations begun to show an interest — presumably because of the "energy crisis".

Family-sized biogas plants first came into widespread use in India in the 1950s in an effort to make a cleaner and more efficient use of cattle dung. The program really took off with additional government support in this decade, and today there may be as many as 100 000 plants. Most are in domestic use for cooking and lighting, but some larger units are operated by cooperatives, government, or industry. One Indian study has estimated that the value of the fertilizer obtained is in itself greater than the cost of producing the biogas. Thus, the system is economically sound, in addition to other benefits such as a cleaner, healthier environment.

The future of biomass

Biomass as a source of energy for the rural areas of the developing world has many advantages including low cost, reduction of waste, environmental improvement, and above all, self-sufficiency. The technology for growing, harvesting and converting biomass for energy production is still in its infancy, and the prospects are good that systematic research will bring rapid improvements. But what stimulates biomass energy research in the industrialized nations is the prospect of economic gain. Such large-scale commercial applications are unlikely to be of much relevance to the needs of the average Third World village.

Bringing village-scale biomass energy to the developing world will require research and development at the local level. It will also need the support of both donor agencies and governments if the full potential of home-grown energy is to be made available where it is most needed. □



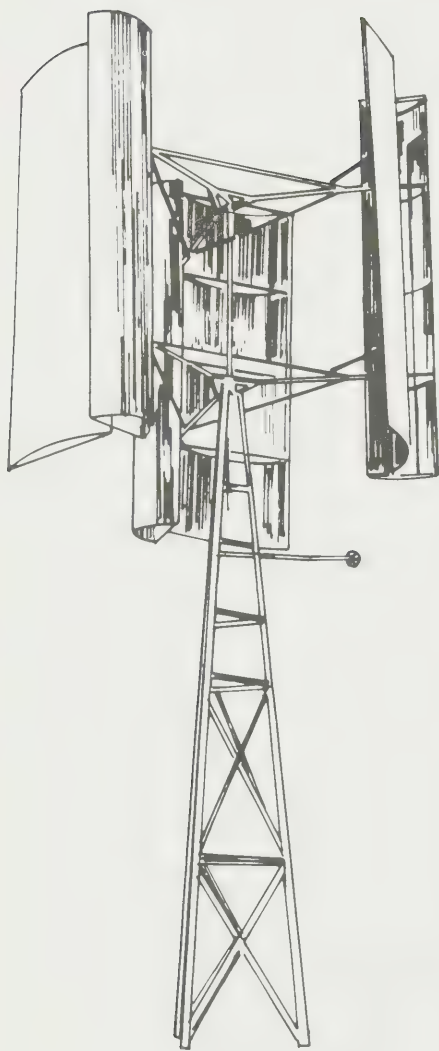
A charcoal and wood market in Africa. Charcoal is four times as efficient as dry wood and the technology of its production well-suited to developing countries.

The information used in this article is taken from Energy from biomass for developing countries, a state-of-the-art report prepared for IDRC's Board of Governors by J.C. Bene, H.W. Beall, and H.B. Marshall. The report has been published for limited circulation in IDRC's Manuscript Report series.

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Development needs energy

David Henry



The Filippini wind rotor, developed in Ethiopia, is being tested for water pumping duties.

Of the four billion people on earth today, one billion — primarily in Europe and North America — use 84 percent of the world's commercial energy supply. Another billion in Africa, Asia, and Latin America consume only one percent. The needs of these people, mainly in rural areas, are met largely through noncommercial energy sources that do not appear in the statistics — firewood, animal dung, and agricultural wastes.

Rural peoples in developing countries are today facing an energy crisis more severe than any produced by a petroleum squeeze in the industrialized nations. Fuelwood trees are disappearing under the pressure of growing demands. The increased cost of petroleum products has led to the substitution of wood, charcoal, and dung for previously used commercial sources, increasing the cost of these traditional fuels.

The role of traditional noncommercial fuels in the national energy picture of developing countries is generally overlooked, despite the fact that they can account for up to 80 or 90 percent of the total energy consumption. This omission is due to a number of reasons: chief among them is the fact that these fuels do not appear in the national accounts or the balance of payments statistics. Furthermore, the people who make the major energy decisions are not the ones who depend on noncommercial energy. This gap between the modern and the traditional sectors is one of the major but less obvious dimensions of the problems hindering the development of more effective renewable energy systems for developing countries.

What are the possibilities for improving the rural sector's access to energy? Until recently, it appeared that the possibilities were limited to the gradual expansion of conventional electric and diesel systems. However, the post-OPEC era has begun to produce some encouraging new approaches based on renewable energy sources such as wind, solar, and biomass energy conversion systems.

Wind energy, for example, is now used quite extensively in Argentina and Uruguay for water pumping, and recent reports estimate that they are producing the equivalent of 300 megawatts of electricity. In the direct solar energy area, rural and remote applications of photovoltaic cells — originally developed to produce electricity for satellites — hold considerable promise. The technical aspects of this energy source are already well defined, and the major task now is to reduce their cost.

The sleeping giant in the renewable energy arena is biomass in the form of wood, cowdung, and other organic matter (see article, page 3).

Making energy more accessible by employing renewables is one approach. Making better use of available energy

is another. The traditional sector is burdened by an extremely low efficiency of energy use. Wood is burned in open cooking fires at the extremely low conversion rate of 5 to 10 percent. Simple improvements in stove construction could greatly improve efficiency, reducing fuel consumption by half. Savings would appear both in preserving forest resources and in the amount of the household budget spent on fuels.

In the agricultural sector, human and animal muscle account for almost the entire energy input on small farms in developing countries. Yet, in many cases, the handtools and equipment used are woefully inefficient. A study in India estimated that about one-third of the draft energy of bullocks is lost to friction through poor design of carts and plows.

Although the savings obtained by conservation can be substantial and have an immediate impact, little research or funding has been applied to exploit their potential.

One of the challenges that faces those concerned with the energy crisis in the traditional sector is a lack of knowledge based on the local social and economic dimensions of the problem. It calls for some well-defined research by developing country researchers which, in addition to producing a clearer understanding of the problem, would develop an indigenous capacity for planning and implementing research programs.

Strengthening the human capacity to choose and direct energy research and technologies could also counter the field's heavy domination by the "hardware" sector. The engineers and technicians who design energy systems have a substantial head start on the "software" people — economists, sociologists and agronomists. Until the latter group assumes a much more dynamic role, the hardware interests will continue to dictate the future.

If research on renewable energy for developing countries is going to produce results that are useful to people in the traditional sector, great care will have to be taken to ensure their active participation in the research. It will also be necessary to develop researchers with a broader range of skills.

Finally, whether or not the potential for a new generation of technologies will be realized to improve the lives of people in developing countries will depend on the ability of politicians and scientists to exercise leadership and initiative in establishing effective mechanisms for the application of the new technology. □

David Henry is a member of the Centre's recently created Renewable Energy Task Force.

Protein from pig waste

Lee Boon Yang

The need for sanitary disposal and economic reuse of human and livestock wastes is of great importance in both developed and developing nations. Significant numbers of people are still living in conditions of poor environmental health, and billions of dollars will be required to provide them with even basic sanitation. The UN General Assembly has recognized this and has proclaimed the 1980s the "International Drinking Water and Sanitation Decade."

In this era of environmental and resource consciousness, the concept of "wastes as resources" is widely appreciated. However, the technology for putting this idea into effective use is not so widely practiced because of various constraints and drawbacks. Scientists throughout the world have taken up this challenge and are concentrating enormous efforts on developing the means to effectively and economically control degradation due to human activities. The Government of the Republic of Singapore, and the IDRC are cooperating in such an effort.



Experimental high-rate ponds for treating piggery wastewater are now in operation in Singapore: pollution is controlled, the water is recycled, and a valuable pig feed is produced.

Much of the Republic of Singapore's total land area of only 580 sq km is being taken up by industrial, housing, and water developments. There is, however, a well-developed, intensive livestock industry producing sufficient pig and poultry products for domestic consumption. The scarcity of suitable agricultural land, and the need to prevent pollution of the water catchment areas, have resulted in further intensification of the livestock industry. The standing population of 0.8 million pigs and 12 million poultry produce almost 14 million litres of pig wastewater and 1000 tonnes of poultry wastes per day which are a major source of organic pollution.

The conventional treatment of human or livestock wastewater often depends on mechanical aeration to stimulate bacterial growth for rapid breakdown of the wastes. Capital and operation costs are often very high, however, which severely limits their application to the treatment of livestock wastes. Low-cost methods using anaerobic lagoons are available, but unfortunately such lagoons often give rise to obnoxious odors. Traditional methods of using the wastes as fertilizer by spreading it on the land cannot be practiced in Singapore, owing to the absence of cropland.

Hence, there is a need to develop low-cost alternatives to existing processes that will overcome the livestock wastes problem. As Singapore imports all of its livestock feed, resource recovery from livestock wastes is particularly relevant.

With these considerations in mind, the Singapore Primary Production Department entered into a cooperative research venture with the IDRC. The project for *Pig Wastewater Purification, Reclamation and Algal Protein Recovery by High-Rate Pond System* was initiated in September 1977. The first phase of the project, now underway, aims to establish a high-rate pond system for the purification of pig wastewater that will permit water reclamation, minimum environmental pollution, and maximum algal protein recovery and utilization as animal feed. A second phase study will also be undertaken to develop equipment and processes for harvesting the microalgae grown in high-rate ponds. Arising from these research undertakings, a

proper system of waste resource recovery will be developed to demonstrate its economic viability.

Algae are ubiquitous aquatic plants that range in size from single-celled microscopic forms (e.g. *Chlorella* and *Micratinium* spp.) to very large common seaweeds. They are capable of absorbing nutrients from the surrounding water and incorporating these by a light-controlled process called photosynthesis into new cell biomass. The value of such algae lies in the fact that algal cells contain 50 percent or more of protein. At the same time, oxygen released during photosynthesis supports the bacterial degradation of the wastes to make them available as food for the algae.

High-rate algae ponds are adapted to utilize this natural process for treating wastewater that contains all the required nutrients for algae growth. Such ponds are shallow to facilitate penetration of sunlight, and the contents are gently mixed to keep algal cells in suspension. Under such conditions, the conversion of wastewater nutrients into algal protein occurs very rapidly, and the attendant release of oxygen purifies the wastewater.

Although the potential of waste-grown microalgae has been recognized for a long time, harvesting is difficult because the algae are microscopic in size and present in low concentration in waste cultures. After 25 years of research, available algae harvesting techniques still have drawbacks. Centrifugation has been used to obtain uncontaminated algae for feeding experiments. Although effective, this method is too high in cost and required energy input to be practical. It appears that a more promising approach is to develop stable cultures of more filterable algae such as *Scenedesmus*, *Micratinium* and *Oscillatoria*.

The IDRC recognized the need for research on a larger scale in the use of the high-rate pond concept for animal waste treatment and algal protein recovery. Hence, in phase one of the algae project, Singapore researchers have designed, constructed, and are operating a series of high-rate ponds for treating pig wastewater in order to establish the conditions under which algae production can be optimized. Some 500 sq metres of pilot ponds are now in use and another 2400 sq metres of demonstration ponds are under construction.

Stable cultures of *Micratinium* spp. have been maintained over the past eight months of the operation. The algal biomass yield was found to be 170 kg per ha per day. Stability of the *Micratinium* culture is an important factor because it is a colonial alga suited for filtration removal. Although other researchers have seldom been able to achieve a nearly monospecies culture for an extended period on waste substrate in open ponds, our experience

to date appears to indicate that this can be achieved under our conditions in Singapore.

Other project activities include the production of biogas from waste solids removed in the primary clarification of raw wastewater before loading into the ponds. This biogas will be used to provide energy for the postharvest processing of algæ, thus enhancing the energy economy of the process. Current feeding experiments with steam-cooked, centrifuge-harvested algæ have indicated that algal protein could replace a large proportion of soybean protein in the pig diet. In the first experiment conducted, algal protein replaced all soybean protein without significantly decreasing growth and carcass quality of pigs over a 3-month period.

During phase two, scheduled to begin in September, the emphasis will be on the development of innovative and economical algæ harvesting systems. It is hoped that the results will provide the breakthrough necessary for making the recovery of protein from pig waste or other organic wastes more than just a concept. It is an important step that could lead to practical application of this method of resource recovery.

The project is still in its developmental stages: it is therefore too early to categorize its total impact in absolute terms. The results now available, however, indicate that large-scale culture of microalgæ on diluted pig wastewater is technically feasible, and promise to advance the state-of-the-art to the point where it can be readily applied.

For Singapore, the most apparent benefit from such an application would be an effective and economical pig wastewater treatment system. This would provide a key for controlling the pollution by piggery waste.

The application of the algæ wastewater treatment system would also enable the reclamation of a large volume of water suitable for recycling as washwater to farms. This would reduce farmers' need for costly potable water. In the drier season of the year, the availability of recycled water would permit farmers to continue the good management practice of keeping pigs clean, thus minimizing the possibility of serious disease outbreaks.

Harvesting the algæ cultured in high-rate ponds leads to the recovery of biologically valuable protein suitable for use as animal feed. Producing algal protein will therefore contribute to the livestock economy in Singapore, which annually imports S\$24 million of soybean products for animal feed.

The recovery of protein in this process could also have significant effects on the world food situation. Current livestock production practice in Singapore and elsewhere is to use soybean products as the main source of protein for livestock feed. The mass production of microalgæ and their substitution in

animal feed would therefore release large quantities of soybean for direct human consumption.

The application of algæ technology is definitely not limited to Singapore. Given the climatic conditions of warm ambient temperature and ample sunshine, many tropical and subtropical countries are suitable for algæ mass culture. Provided that organic wastes are readily available, high-rate ponds can be used. The Singapore project will yield the required scientifically documented and evaluated results that will provide a sound basis for application and technology transfer to other countries.

In terms of technology transfer and expertise development, this project is staffed by Singapore scientists and engineers recruited from the ASEAN region. Only one part-time American consultant, with previous experience in algæ technology, is employed on the project.

All the project facilities have been designed and constructed in Singapore, using locally available manufactured items, equipment fabrication, and construction skills. Only a minimum number of components such as pumps, centrifuge, specialized speed-reducing units, drum-dryer, and instruments have been imported, in many cases from other Asian countries. This attempt to develop local technology has resulted in project costs far below that of comparable facilities in developed countries. It therefore puts the Singapore model within the economic means of many developing countries. Thus, in addition to providing the technology for waste treatment and resource recovery, the mass culture of microalgæ as developed in Singapore will also provide benefits to manufacturers and construction industries in countries that plan to adopt similar technology.

The Singapore project is an example of adaptive technology transfer. Mass culture of microalgæ, though long recognized for its potential in sewage treatment, has not been studied as intensively for livestock waste treatment. There are also technological obstacles, such as harvesting methods, that need to be overcome before the process can be fully utilized. Singapore, with its intensive pig industry, has the unique potential to make an in-depth effort to apply known research findings to develop a new aspect of the concept. The project is therefore playing a role in developing an appropriate technology for application in other countries. □

Lee Boon Yang is a graduate of the University of Queensland's school of veterinary science. He joined the Primary Production Department of Singapore's Ministry of National Development in 1972, where his interest in animal waste utilization was aroused while studying the use of poultry litter in cattle feed.

This article is adapted from one chapter of Give us the tools: science and technology for development, recently released by the IDRC (see page 27).



Low-cost housing in Singapore. As general living conditions improve, population growth declines.

Population message from the village

Michelle Hibler

Tarzie Vittachi, Chief of Information of the United Nations Fund for Population Activities (UNFPA), recounts a conversation he recently had with a taxi driver in Mexico City where he was attending a population conference:

"Very important problem for Mexico. Any solutions, sir?"

"No", replied Vittachi.

"Just as I thought."

And yet, the young driver, after two children, had undergone a vasectomy to assure his family of a better life in the growing city.

A few years earlier, in Singapore, Mr Vittachi was visited by a Sri Lankan couple who had sought him out, a very distant relative, for advice on family planning. The previous week they and their four children had been relocated from a squatter settlement on the outskirts of the city to a modern, high-rise, low-cost apartment building. A problem had arisen: by 8 am the father had to be at work, and three of the children at school. But as early as 6 am, the queue for the communal washroom stretched down the hall, making it nearly impossible to be on time. In their former home there had been no problem ... there had been no washroom. They reasoned that more children would make this situation worse.

Amusing anecdotes perhaps, or, for the family planning workers, proof that population programs are having some effect. But these two stories also provide a glimpse of what lies at the heart of the population question — individuals, personally motivated. With a change in these people's living conditions had come a change in their values.

Mr Vittachi was addressing a meeting of population experts and journalists gathered together in London, Ontario, at a conference on *Population: from now to 2000*, sponsored by the School of Journalism of the University of Western Ontario and the Canadian International Development Agency (CIDA). What emerged from the three days of sessions was an overview of the population question and of how

perspectives have changed in recent years, following the apparent failure of many birth control programs, the Bucharest Population Conference, and now, the optimistic note that global fertility levels are declining.

The recent drop in the rate of population growth, following hard on the heels of the doomsday reports that the population bomb was about to detonate, has been widely reported. The UNFPA's best estimates indicate that since the 1960s, birth rates have fallen by some 15 percent in 45 to 50 developing countries representing 40 to 65 percent of the developing world. Will they continue to fall, however, and at what rate? Will fertility rise once again? At this point the debate is raging between demographers who cannot agree either on the future trends or the causes of the present decline.

No matter how encouraging the trends, the UNFPA cautions that they should not obscure the fact that even if fertility was to fall by 30 percent by the year 2000, it would still bring the world population to at least 5.8 billion people. Some two billion more people will need to be fed, educated, cared for, and employed.

If agronomists and economists are right, we cannot expect another significant rise in world food production. According to Lester Brown of the World-watch Institute, most countries have known only a slight increase since 1971, when the effects of the Green Revolution and other developments petered out. In the USA, one of the world's major food producers, there is also now a technology gap: all known agricultural technology for increasing yields is being applied. Faced with a shortage of new land, energy, and water, the most one can expect, he said, is an increase of one percent a year, not enough to match the population increase.

Some, like Mr Brown, argue that food scarcity may well become a contraceptive factor. Food is only one element of the complex equation of development, however, although it has a direct bearing on health and

mortality. The slowdown of population growth has been attributed in part to a decrease in infant mortality and a longer life expectancy in developing countries. If a shortage of food overturned these improvements, it could have the effect of stimulating fertility, resurrecting the spectre of the "population bomb".

The link between food and population is a long-standing one, enshrined in western (industrialized) economic thought and theory. As explained by Prof. Charles K. Wilber, Chairman of the Department of Economics of the University of Notre Dame in Indiana (USA), the seeds were laid when Thomas Malthus published his essay on population in 1798. The poverty of the poor, explained Malthus, is a function of the poor's proliferation of their own numbers. The earth cannot match this fecundity and provide enough for everyone's subsistence. Because of the free market law of distribution, the rich are powerless to help the poor. If only the poor would accept this truth, he said, they would feel less discontent and irritation at the rich.

Of course, Malthus' theory fell in line with Adam Smith's self-interest economic theory, whereby a competitive system would make the most efficient use of resources and result in the common good. If poverty still existed, it was because some countries restricted the free operation of markets, or it was the result of the miserliness of physical nature and the improvidence of human nature in the form of population growth.

Over the years, population growth thus became the easy explanation for underdevelopment. As the complexities of the underdeveloped countries became better known after World War II, economists came to recognize that economic development influenced population growth as well as the other way around. Thus was born the "demographic transition" theory wherein population growth would decrease as development proceeded, but only with a time lag. The crucial problem of development became one of controlling population growth until the transi-

tion was completed. Population control became the *sine qua non* for any successful development program.

If it sounds familiar, it is because this theory is still much in vogue. It is a comfortable theory for the industrialized countries because it lays the blame neatly outside the scope of political and economic systems, right at the feet of individuals and the perversity of human nature. The western cultural dominance also pervaded the search for solutions, and from the fascination with technique and technological solutions — far easier than political ones — came the obvious technological response to the problem of poverty: education, training programs, and birth control.

The dismal performance of the birth control programs that proliferated might have shaken the foundations of the theory somewhat. The fatal blow came in 1974, in Bucharest, at the World Population Conference when the developing countries rejected the agenda — and the premises — established by the industrialized countries.

The consensus at Bucharest was that population should be viewed from its historical evolution and as inseparable from political and economic problems. Development, it was said, is the best contraceptive. This "developmentalist" view, emerging strongly in the Third World and gaining ground in many aid agencies, stresses that population growth *per se* is not an important variable in economic development. The emphasis of development policies should be rapid economic change, which will mean change in socioeconomic institutions, which will in turn lead to a decrease in fertility. Emphasizing a direct attack on population growth is seen as a diversion from the main problems, and besides, it will probably be unsuccessful.

The new issues of population are seen not to lie in whether you must first stop population growth and then develop, or the other way around, or both simultaneously, but in whether there are more direct correlates of fertility decline like women's education, reducing infant mortality, raising levels of health, which — if tackled directly — would make it possible to slow down population growth earlier, and with fewer resources. "This does not imply that there is no need for family planning programs", says Mr Wilber, "only that they must support general development strategies, not be the main thrust of development policy itself."

It's another theory, but one that has some examples to support it. Prof. T.N. Krishnan, formerly of the Centre for Economic Studies in Trivandrum, India, and now at UNFPA, outlined the experience of his home state, Kerala, where birth rates are rapidly declining and had begun to do so before India intensified her family planning program.

Located at the southwest corner of India, Kerala state is geographically cut off from the rest of the country. As a result of its isolation, and a flourishing spice trade that brought visitors to the region, it developed differently than the rest of the country.

The two southern districts — Travancore and Cochin — were "native" administrations under the British, ruled by Maharajahs, a status that permitted them a degree of autonomy. Matriarchal societies, they were strongly influenced both by Christian missionaries and Arab traders.

From the mid-1800s, health services and schools were established. As education spread — to women as well as men — government posts became available to the population, who clamoured for more schools as a means to enter the "modern" sector. The spread of education also led to a greater recognition of the importance of health care (the Ayurvedic tradition had been long established), and clinics and hospitals multiplied. Because the population of these districts was dispersed rather than concentrated in villages, the health posts were located in easily accessible areas.

As education and health care increased, infant mortality rates declined and life expectancy increased. The age at marriage rose, and birth rates began to decline. By 1956, the birth rate was 35.6 per thousand. In Malabar, a district to the north annexed that same year to form Kerala state but which did not share Travancore's and Cochin's history, the birth rate was 45.6, a rate comparable to the rest of India. By 1971, Travancore and Cochin had a birth rate of 24.7; Malabar, 31.1. By 1975, the birth rate in parts of Kerala was as low as 21 per thousand.



Maternal and child health clinics, like this one in Thailand, contribute to reducing infant mortality and raising levels of health, two important factors of fertility decline.

These changes were effected in Kerala without overall economic growth — which lays to rest the theory that falls in fertility take place only when there is economic progress — and before India's family planning program gained momentum. It is also significant that the incomes in Kerala are not higher than in the rest of the country, nor are the expenditures on health and education. The useage of facilities is, however, considerably greater. And if the incomes of individuals have not increased, their living conditions have improved considerably as a result of better education (the female literacy rate was 52.5 percent in 1971), better health, and land reforms that gave the landless ownership of their means of subsistence.

The case of Kerala may be unique in many ways, but it supports the developmentalist view of population growth and decline.

But why is it, asked Kumares Chakravarty, Assistant Director of the Press Foundation of India, that despite their declared stand, and the evidence that declines in infant mortality and greater education — particularly of women — have been found to have some favourable impact on the birth rate, most developing countries still accord highest priority to family planning education, sterilization incentives, and strong media campaigns in support of smaller families? In India, for example, public expenditures on family planning grew from 1.45 million rupees in the first development plan in the mid 1950s, to 2844.33 million for 1969–74, to 4973.6 million in the fifth plan (1974–79). Public expenditure on education and health, he said, have meanwhile shown decelerating growth rates; women's participation in the labour force is decreasing; and, despite bumper crops, actual food consumption in India has stagnated or even decreased among the poor.

Whether the next 20 years will see a significant change depends on a wide range of issues, from unemployment in the industrialized countries, to international migration and racism, to restructuring the economies of developing countries to distribute benefits more widely. There is no one solution because there is no one problem.

In many ways the world and the population experts have received what Tarzie Vittachi calls "a message from the village". And part of that message is that things don't have to get worse before they get better — they have to get better before they get better. □

The proceedings of this symposium and of an earlier one held in England will be published in August. Contact the School of Journalism, University of Western Ontario, London, Canada N6A 5B7.

Diversity and development

Henrique Tono
Regional Director, Latin America
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DOSSIER:
LATIN AMERICA & THE CARIBBEAN

The many countries and islands that make up Latin America and the Caribbean present a great diversity of physical, social, economic, and political characteristics. Latin America and the Caribbean, like Asia, form a subcontinent of great contrast.

Natural resources abound — oil, minerals, large waterways, rich marine life, and extensive tropical rain forests. Technical and economic constraints hinder the realization of the region's full potential, however, and the region's arable land area of some 1500 million hectares — of which almost 600 million are exploited — remains the basis of the region's economy. But the ownership of land and of capital resources, as well as of the technology for its exploitation, is very inequitably distributed and favours a small minority. The resulting very low standard of living in the rural areas has forced an exodus to the urban centres.

The most diverse origins and cultural backgrounds are represented in the Latin American and Caribbean population, from advanced pre-Colombian civilizations, to European and Asian colonizers and immigrants, to African slaves. At present, the population numbers 320 million people spread over some 21 million square kilometres.

The population tends to cluster in the main urban centres, some of them, like Mexico City, Buenos Aires and Sao Paulo, among the largest in the world. And while in Argentina the rural population accounts for only 17 percent of the country's total population, in some countries like Bolivia and Guatemala 70 percent of the population are rural dwellers. Rural peoples usually lack adequate health and education facilities, means of communications, and organized markets. They are virtually excluded from political life. And because of its limited development, the industrial sector cannot absorb the available manpower from these rural areas as well as from the cities. For a large part of the population, there is no alternative but to pursue activities of mere subsistence, or join the ranks of the unemployed.

There are, nevertheless, countries and regions within countries with higher relative levels of development, as reflected in their higher education levels, higher incomes per capita, and efficient infrastructures and services.

Because of the region's diversity, no one program or development formula can be uniformly applied. That is why the IDRC promotes and supports the search for solutions appropriate to each. The Centre emphasizes development research as the best catalyst for stimulating the progress of developing countries.

In its eight years of operation in the region, the Centre has supported 191 research projects, representing a contribution of some Cdn\$30 million covering almost all the countries. The main areas of research are those directed at solving the most important development problems — agricultural production and productivity, nutrition, health services, education, housing, science and technology, population and migration, as well as information management as a development tool.

It is impossible in a short dossier to fully describe the diversity of research activities supported by IDRC in Latin America and the Caribbean. The following articles present only a small sample of the work underway. Nevertheless, it is representative of the areas of research as well as of the spirit that guides the activities in the region — solving the problems and meeting the needs of the marginal rural populations.

Tracking down the pathogens

Michelle Hibler

Late February. In the village of Santa Maria Cauque, in the Guatemalan highlands, some 35 km from Guatemala City, a 3-week old boy is seriously ill, suffering from severe dehydration brought on by gastroenteritis. In the clinic, Dr Juan José Urrutia, Chief of the Nutrition Infection Program of the Institute of Nutrition of Central America and Panama (INCAP) and physician for the village, is trying to convince the child's grandmother that he should be hospitalized.

Outside the small clinic, dozens of children are playing — bright-eyed little girls in traditional colourful woven Indian dresses and barefooted serious boys. While they look healthy, their small stature is a tell-tale sign of earlier malnutrition.

In the building across the square, Dr Alberto Levy, also of INCAP, is explaining to a group of *promotores* how dirty water causes diarrhea in infants. The *promotores* are village women who visit homes two or three times a week to inquire about the health of children, and instruct mothers to bring the sick children to the clinic where they will be given oral rehydration salts and instructed on how to administer them. Today only 13 of the village's 30 *promotores* are present. It is corn harvesting time and the others are at work in the fields or are preparing the corn that, with beans, forms their staple diet.

Intestinal infections and associated diarrheal diseases are a leading cause of ill health and death of children under five in developing countries. A study carried out in Santa Maria identified diarrhea as responsible for 43 percent of all disease and disabilities in children under three. Across the Caribbean sea, gastroenteritis affects 15 percent of children and accounts for 40 percent of infant deaths.

The problem is largely due to the poor sanitary conditions to which children are exposed daily and which foster the spread of diarrhea-associated pathogens. In Santa Maria Cauque, for example, 85 percent of the houses have a standpipe in the yard. But as the electric pump operates for only a few hours a day, water is stored, often in open containers, in the house which is

also shared by chickens and other animals. Some empty containers are lying in the yard littered with crop refuse and animal feces. At the back of many houses open pits serve as latrines — and as a source of infection.

Children in this environment can be infected during the first few hours of life. Malnutrition and the lack of immunological protection that will follow when breastfeeding is ended make the older children even more susceptible to infection.

Yet in spite of the severity of the problem, research into the causes, pattern, and consequences of intestinal infections has been inadequate. Until recently, scientists had identified three major types of diarrhea-related pathogens: bacteria such as shigella and salmonella, parasites, and viruses. These agents accounted for only half the cases of the disease, however. The studies had also been based on data from hospital cases, which did not take into account the natural environment and disease transmission modes of affected populations, and most of them had been carried out in developed countries where climatic, sanitary, and nutritional conditions differ greatly from those in developing countries. Finally,

these studies relied on expensive human and laboratory resources not available to developing countries.

During the past few years, however, some promising leads have opened up. A major finding was the identification in 1973 of another type of virus — rotavirus — as one of the principal causes of severe intestinal infections among young children. New and simple laboratory techniques are also being developed for the identification of rotavirus without the need for sophisticated equipment.

These leads are being followed in an INCAP project directed by Dr Urrutia. From 1964 to 1970, a long-term study had been carried out in Santa Maria to determine the patterns of intestinal infection, morbidity by infectious disease, dietary intake and growth. During this study 45 children were followed from birth to age three: fecal specimens were collected daily during the first week and once a week thereafter.

The study revealed that children are subjected to very intense and frequent intestinal infections which start early in life and increase as the children get older. Children in their second year were found to be particularly susceptible (in Santa Maria, infants are breastfed for the first year). *Shigella* pathogens were found to be the most common agents, but half the diarrhea episodes could not be attributed to a specific agent.

The samples collected during this first study — 11 000 of them — were kept in deep freeze at INCAP and, with IDRC support, are now being re-examined to determine the frequency of rotavirus infection, unknown at the time the first study was carried out. And while electron microscopy is considered the best method of identification of rotavirus (which has not yet been successfully cultivated), a new technique has been found that is simple, quick, and reliable. The enzyme-linked immunoab-



Dr Alberto Levy instructs village health promoters in Santa Maria Cauque, in the Guatemalan highlands.

Photos: Jaime Rojas

sorbent assay technique, known as ELISA, is suited to the field laboratory situation and is being tested in this study.

Preliminary results from the examination of some 4500 samples show that rotaviruses are excreted by half of the children in their first five weeks of life although they do not show any symptoms of infection. By age one, all children are infected, but the rate of infection is reduced as the child gets older. The disease reaches a peak from 9 to 23 months, following the termination of breastfeeding. In their second year of life children suffer from diarrhea 15 to 20 percent of the time and it tends to be much more severe. Rotavirus infections are most common during the winter months when the agent is more prevalent, salmonella and shigella during the wet season. Rotaviruses are also commonly found with chronic infections.

The consequences of these frequent bouts of illness are obvious: food consumption is reduced, both because the mother will cut down on the food given the sick child and because the child has little appetite, digestion is impaired, and the absorption of nutrients is diminished. This reduced caloric intake during illness results in malnutrition. In fact, the researchers found that despite the poverty in Santa Maria, the children's food intake, when they were well, was adequate for normal growth. If malnutrition occurred, it was a result of frequent illness.

A similar pattern of infection is emerging in Trinidad and other Caribbean islands where CAREC — the Caribbean Epidemiology Centre — is conducting a study of viral gastroenteritis in children under three.

The Fifth Commonwealth Caribbean Health Ministers' Conference held in 1973 called for a strategy and a plan of action to deal with gastroenteritis and malnutrition that cause a "large preventable waste of life in children under two years of age". The plan of action stressed preventive measures including improved environmental health services, maternal and child health services, surveillance of nutritional status, immunization, encouragement of breastfeeding, family planning and antenatal care, and management and follow-up of gastroenteritis and malnutrition. The target: reduction by 50 percent of the mortality from gastroenteritis by 1980.

Work at CAREC began in 1975-76 with a study of the bacterial and viral etiology of gastroenteritis in Trinidad in which well-known agents — salmonella, shigella, *Echo Polio* and Adenovirus were isolated. For the first time, rotaviruses were detected in the area.

A more in-depth study began in 1977, with IDRC support, in Trinidad, St Vincent and Guyana to increase knowledge of the epidemiology of infantile gastroenteritis as a background for devel-

Nurses Veronia Roach and Olga Wilson screen new admissions in Trinidad: basic data is essential.



oping preventive measures. The emphasis is on the cause of the disease, particularly on the role of rotaviruses, disease transmission and related conditions that contribute to making the disease such a large health problem.

At Port-of-Spain General Hospital, the problem takes on very human dimensions. There are close to 50 children in the gastroenteritis ward, and at times the number reaches 80. According to Dr David Bratt, lecturer in pediatrics at the hospital and consultant on the ward, 8 to 12 children are admitted daily, many for the second and third time. Most of them are less than a year old. Most of them are not breastfed. "You can literally say that I have not seen one baby who was completely breastfed who got gastroenteritis", he says.

Nurses Veronica Roach and Olga Wilson who are collaborating in the project are screening new admissions. The children are weighed, measured, and records are made of previous incidences of diarrhea and of the treatment. "One of the problems is a lack of basic data", says Dr Bratt, "that's why the study is so valuable." Children under three admitted at this hospital, and at the one in San Fernando, will be included in the study if they meet the criteria — that they have not been ill for more than five days, not have been treated with antibiotics before admission, and live within a certain distance from the hospital.

The distance from the hospital is important for the follow-up visits after the child has been discharged. Today, Nurse Wilson is making her way up the stairs of a government apartment building in a low-income area, on the hill overlooking Port-of-Spain harbour. In a small apartment on the top floor, Martin, who is nine months old, is being checked for the last time. Since his discharge from hospital about a month before, he has gained one pound, and according to his older sister, has not had any recurrence of diarrhea.

Martin is one of 300 children who

will have been studied in Trinidad at the close of the project. Virology tests on the samples are done partly at CAREC, partly at the department of Medical Microbiology of the University of Toronto using an electron microscope. Preliminary results show that in Trinidad and St Vincent, two distinct peaks occur — one in February/March, and one in July/August. Rotaviruses seem to be strongly associated with illness, particularly during the dry season, followed by salmonella and shigella during the wet season. In Guyana, however, no rotaviruses were found in the first samples and shigella seems to predominate.

As in the INCAP study, the incidence of rotavirus infection increases as the children get older and the symptoms are milder than for infections caused by other pathogens: generally vomiting and diarrhea occurred simultaneously, dehydration was mild, fever slight, and the illness of short duration.

A study of the children's environment shows that family members may be the source of infection. The water supply — a chronic problem in Trinidad — also appears as a main culprit. In the majority of cases, the families also depend on pit latrines.

Children suffering from gastroenteritis tend to have had lower birth weights, and fewer have been breastfed. More have been found to be malnourished than in the control group.

As Barbara Hull, CAREC Virologist and leader of the project, points out, however, there are still cases for which no agent has been identified. The recent finding of an anerobic agent — the *Compylobacter* — may help explain some of these. "We are always happy to find a new pathogen", she says. The samples will be screened for this pathogen.

In the course of the study, still underway, the team has also been able to discredit some agents commonly held to be responsible for gastroenteritis — the enteroviruses — which occur too frequently in the healthy control group of children to be considered a causative agent.

It has also been found that children treated with broad spectrum antibiotics, ineffective against rotavirus, were more seriously ill on admission to hospital because of the delays incurred while waiting for a cure. The infection in these children also tended to last longer.

From these studies and others being carried out in Asia should emerge a much clearer picture of the origins and causes of infantile gastroenteritis, its patterns and clinical characteristics. This information is essential if preventive measures are to be developed, and if Third World children are to have a better start in life. And as the preliminary results in Guatemala and Trinidad clearly show, these measures will need to be aimed at the very young. Any solution that misses a child in the first few months of life is too late. □

Teachers schooled in health

Susana Amaya



Porfiria de Martinez tells of the time a small boy called her to come and care for his mother, who insisted that she had only been pricked by a thorn and would recover without going to the health post. Porfiria suspected that the woman was suffering from snakebite, however, because although there was no visible wound, the woman presented obvious symptoms. Against her patient's will she had her taken to the health post where, two days later, health officials confirmed her diagnosis. The patient had arrived in time for treatment. Had her arrival been delayed a little longer, she could not have been saved.

Porfiria is proud of her work, which involves caring on a day-to-day basis for the health of people who consult her. But Porfiria is not a traditional healer, nurse, or physician. She is the third grade teacher at Primary School 303 Alfonso Loma, seven kilometres from Caraguatay, in the centre of Paraguay.

Every day Porfiria teaches two different sessions — girls in the morning and boys in the afternoon. In her free time, she cares for those who come to consult her, and on weekends she visits the families assigned to her. Francisco Gamarra, principal of this primary school, and this wife Eudelia, the sixth grade teacher, also work as health promoters. And there are 100 other rural teachers in Paraguay working with them in this year-old program, officially called the Rural Teachers Health Services Extension.

The program grew from the fortunate meeting of two physicians, Ruben Mallorquin, Director of the First Sanitary Region of the Ministry of Health, and Anibal Rolon, Professor of Pathology at the National University of Paraguay. Both were concerned about the gap that existed between the university and national reality, particularly in the rural areas. Health coverage, through the Ministry of Health's system of hospitals, health centres and posts, reached about 55 percent of the population.

Dr Rolon thought that rural teachers, who are in contact with the population and serve in a large number of schools, even in remote areas, could become effective health promoters, because they are well trained, are community leaders, and have the ability and willingness to serve. A project to test this belief began in 1977 with IDRC assistance in Pucu Island and Caraguatay, Department of Cordillera, which belongs to the First Sanitary Region.

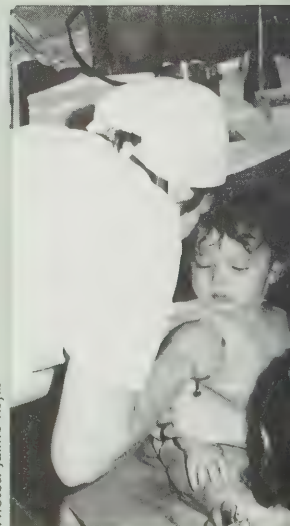
As a first step, the Ministry of Health mapped the area, locating and numbering each rural dwelling. A survey was then conducted among teachers to determine if they were interested in the program, and how much time they could devote to it. The survey showed a high degree of interest, although the teachers had been forewarned that their participation would be voluntary.

Close cooperation between the Ministries of Education and Health was necessary, and both, as well as the university, provided different levels of trained, enthusiastic staff for the project.

"We thought that it would be the first program of its kind in the world", says Dr Rolon. "Then we found out about the program in India and were fortunate to have the IDRC bring the director of the Indian program, Dr Bajaj, to Paraguay. So we were the second to do it." Dr Bajaj provided advisory services during the initial phase of the program.

A special feature of both the Indian and Paraguayan programs is their use of teachers as volunteers. The program's designers had considered the teachers because of their special influence in the rural regions, their large numbers as a result of a well-developed primary school program even in the most remote areas, and their high level of training. The health system, on the other hand, is not well known in rural areas, provides limited services, and is underutilized. Dr Mallorquin affirms that for him the best feature of the project is that the teachers will act as

A latrine under construction: the demand is now greater than the supply.



Photos: Jaime Rojas

extensions of the local health posts by promoting them, explaining their use and advantages to the population, and generally making access to the health posts easier.

The project area is relatively isolated, but has a high concentration of well-qualified teachers. The participating teachers were given a two-week training course during the summer vacation that focussed on the delivery of educational, curative, and preventive services in such areas as maternal and child health, nutrition, first aid, sanitation, etc. Many materials were prepared for this course, including the *Community Health Manual for Rural School Teachers*, adapted from the Indian program. The manual describes the principal illnesses found in rural areas, and how to treat and prevent them. Two other manuals were also prepared, one on environmental sanitation, and the other on how to record information and conduct surveys.

CIMDER, a rural health development project carried out in Colombia with IDRC support, contributed to the project through its information recording systems and its tricoloured strip developed to measure the nutritional condition of children (see *Reports* Vol.7 no.1).

The training course was held at Caraguatay and Caacupe, a district capital with a well-equipped hospital. Working in groups of 15 to 20, the teachers received essential theoretical and practical training. They also came into contact with the hospital environment and with those people with whom they would later work as well as with the sick, particularly hospitalized children. The results of a written examination at the end of the training course were satisfactory.

Teachers were then given individual assignments. Each is responsible for some 50 families living in his or her school area or neighbourhood. Thus, some 25 000 people are covered. The teachers' first contact with their families involved a demographic-health survey which familiarized them with their assigned families, their living and sanitary conditions. This information, as well as information gathered during weekly visits, is gathered, pre-classified by the project supervisor, and sorted for project monitoring and evaluation. It also provides the project's directors with a picture of local problems, weak points, and areas that the teachers have not understood well. To deal with local problems and continue the teachers' training, the executive, scientific and administrative staff of the project visit the schools and meet with groups of teachers.

Great demands are made of the teachers' time. Their weekdays are spent in the school, so they must devote their weekends to house-to-house visits of families and patients. Some families live in such remote areas that the only way they can be

reached is on foot, by horse, or by horsedrawn cart. The teachers' families also participate, as spouses often accompany the teachers *cum* health promoters on their visits, or, as in the case of the Gamarra family in Alfonso Loma School, both participate in the project. Says Eudelia de Gamarra: "Thanks to the health work that the teachers have been doing, we have seen many changes ... in environmental health, and in maternal and child health. It's a lot of work for us, but we're willing to do it and we're making a contribution to the country at the same time."

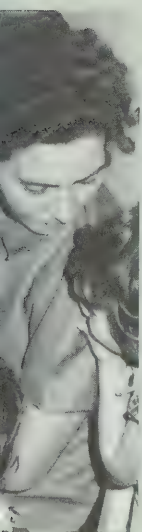
One effect of the project has been to create an unexpected demand for latrines. The district health inspector explains that his installation allotment of 50 latrines a year ran out during the first few months. "More latrines are installed in one month now than were previously installed in six or seven months", he says. Sometimes the demand for the prefabricated squatting plates is greater than the supply that is stored and sold in the school. Each costs 450 *guaranies*, and the family contributes labour for building the latrine while the health inspector supervises the work. The cost of an installed latrine is 10 000 *guaranies* (about us\$75), a substantial sum for a rural family. Nevertheless, they have proliferated in the project area.

The project has also had beneficial effects on vaccination campaigns. Without the teachers' assistance, these campaigns are difficult to launch, costly, and require door-to-door promotion. Now, the children bring home the information, and a large number of parents attend with preschool children. In the Juan Pereira School in Villa San Juan, 240 children received several vaccinations on one day in late April. Just a short distance away, at Primary School 362 in Pindoty, many parents were attending a meeting with the health inspector, despite the fact that it was a work day.

Two of the project's key people are the health and education supervisors. The health supervisor, Blanca de Antunez, an obstetrical nurse, lives in the area and works with the teachers every day, visiting them at school. Victoria Mareco, education supervisor and an enthusiastic supporter of the project, says that "the school has become the centre of the community through this program". One reason is that the teachers are in direct and constant contact with their families through the children who are the best messengers. But she explains, the main reason is the deep-rooted conviction in the community that "the teacher is always right". □

Susana Amaya, Associate Director of IDRC's Communications Division and co-editor of CIDO Informa, based in Bogota, has recently visited projects in several Latin American countries.

Porfiria de Martinez, teacher and health worker in Caraguatay, Paraguay.



Vaccination campaigns reach more families as a result of the teachers' health promotion.

Understanding the small rancher

Susana Amaya



Eduardo "Lalo" Vega, 33, father of four and a primary school graduate, started off as a ranch hand and farm manager, learned the cattle trade, and proceeded to fall in love with it. On the nine hectares of land he bought in Santacruz, at 1200 metres altitude near Turrialba, Costa Rica, he set up a specialized dairy farm. In three years, dairy farming has enabled him to repay half of his debts (US\$20 000), make many improvements, and recently, buy a small work truck. Although he has only 17 cows, they, like the land, are well-managed. The land is divided into many pastures, which are used on a rotating basis. The cheese he and his wife make from the milk, with the occasional help of a nephew, is sold on the farm to merchants. Eduardo is also the local "veterinarian" and he gives generously of his experience and knowledge to other producers in the region.

The case of Eduardo Vega is rather exceptional and can basically be explained by his hard work, his understanding of dairy farming and management, and his ambition. His success is not the product of technical assistance programs, training courses, or management schemes developed in experimental research programs, although Eduardo does not refuse this type of assistance when it is available — and useful. For instance, his contact with professionals and experts from CATIE — the Centre for Tropical Agricultural Research and Training based in Turrialba, in the Atlantic lowlands of Costa Rica — has given him the opportunity to discuss his problems and improve his cattle management.

Lalo Vega was one of a sample of 230 farmers interviewed by CATIE. The sample was made up of farms of less than 50 hectares or fewer than 25 head of cattle, representative of 60 percent of all Costa Rican farms. The survey was carried out between November 1977 and January 1978 in Turrialba, San Carlos, San Isidro de El General, and Guapiles in order to learn about the different cattle-raising and agricultural production systems in

use on small and medium-sized farms in these regions, and the farmers' resources and constraints. The first survey was of a static nature: to record farm conditions and characteristics at a point in time. In order to obtain a dynamic picture of resource flows and management, a second survey was then undertaken that included the observation and recording of the activities of 40 farmers selected from the original sample over a year. Eduardo Vega was in this group. He is also one of 10 producers with whom CATIE will continue to work during the next year.

Although cattle raising is important in Costa Rica and other Central American countries, little is known about the systems used by small and medium-sized ranchers. CATIE's animal production program is directed at this group, and endeavors to improve their cattle-raising systems. A three-year project to develop integrated crop-livestock production systems began with IDRC assistance in 1977, under the direction of a Peruvian economist, Manuel Ruiz, of the Panamerican School of Agriculture in Honduras. Working with Dr Ruiz on the project are Marcelino Avila, agricultural economist, and Danilo Rezo and Arnoldo Ruiz, nutritionists. Their work is part of the animal production program headed by a Chilean agrostologist (a specialist in grasses), Gustavo Cubillos.

Cubillos explains their study of the role of cattle raising on small farms on the basis of understanding what producers think and do, or could potentially do. This is why the study and its follow-up are so important. The result is a two-way training experience benefiting both farmers and researchers. The experience gained by the researchers is in turn used to generate a methodology for the transfer of technology.

In order to have a direct on-site learning experience, CATIE has built an experimental station known as the "IDRC-CATIE module" in which researchers are studying the dual-purpose form of cattle raising revealed by the survey to be most common in the region. In this type of system, cows are permitted to

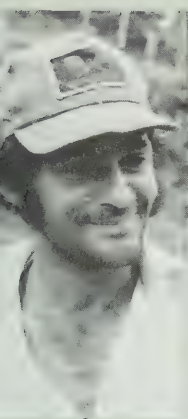
nurse their young, and only milked once a day. Milk and meat — the calves — are therefore obtained, illness in calves is reduced, and calf mortality declines. However, it also means that milk production decreases in relation to the reproduction rates. Both of these points are under study.

Built on CATIE-owned land, the experimental farm simulates actual farming conditions. At present it has 14 cows, all of which calved in 1978. Plantain, cassava, and a mixed-crop of corn and beans are grown. Trees, mainly the *poro* (*erytherina preppigiana*) and the *madero negro* (*glinicidie sepium*), are used as live fences.

Dual-purpose cattle raising, very popular in Central America, accounts for 57 percent of livestock production in Costa Rica, 68 percent in Panama, and more than 80 percent in El Salvador. The advantages of this system are above all socioeconomic: the prices for the products mutually compensate each other, thereby minimizing the risks to the producers.

The inclusion of crops in this system and the use of crop residues are also being studied. One area of research deals with the use of tropical crops as animal feed. In experiments with cassava, crop density is varied in order to determine the effect on root and foliage production. Cassava foliage is rich in protein — the scarcest nutrient in tropical areas — and, if managed differently, could be produced to replace alfalfa (which is not grown in the tropics) as a source of fodder.

Another area of research is the use of crop by-products. The bean plants, for example, are pulled out of the ground when the beans are harvested, and after the beans have been removed, the foliage and the roots are burned or discarded. Experiments have shown that cattle will eat these residues, and milk production is increased when they are fed bean straw, supplemented with crude protein and molasses. Corn, sweet potatoes, and sugarcane offer similar possibilities as ingredients in cattle feed.



Photos: F. Solano

Eduardo Vega (right). Small-scale cattle raising is being studied at CATIE's experimental "module" in Costa Rica (left).

Within CATIE itself, the project has contributed to strengthening the multidisciplinary approach in the study of the farm as a system, as different disciplines are involved in the study. The project has also enabled students from nine Central and South American countries to undertake postgraduate and in-service training.

Work in the project will continue for another year during which biological research will continue. Eight out of 11 studies have been completed so far: they include topics such as digestibility, nutritive value, voluntary consumption, effects of agronomic practices with beans, cassava, corn and sweet potatoes. The work with the 10 selected farmers will also be continued. This study is intended to document the receptivity and acceptance of these farmers to technology transfer.

On a larger scale, the research has been extended through cooperative efforts with IDIAP — the Agricultural Research Institute of Panama — and, at the national level, the project has involved the Ministry of Agriculture and the Institute of Land and Settlement in different geographical and ecological zones. In many cases, the work is complemented by projects supported by the Interamerican Development Bank and AID's Regional Office for Central America and Panama.

Created five years ago by the Costa Rican government and IICA (the Inter-American Institute of Agricultural Sciences) — which endowed it with a scientific legacy — CATIE aims to support Central American and Caribbean countries in the areas of food production and forest development. Focused on the small farmer and international in outlook, CATIE is well suited to undertake projects such as the Centre-supported animal production project which will benefit low-income rural peoples. □

Media meets the masses

Susana Amaya



Photo: Jaime Rojas

A cassette school in the village of Sao Paulo, Brazil, reaches out to isolated populations.

The road from Sananduva to the tiny village of Sao Paulo — a cluster of houses around a church, parish school and meeting hall — swiftly rises and falls, wraps itself around sharp curves and opens onto deep valleys, dark green mountain landscapes, and fields of soybeans and millet that climb up steep hills.

The village parish hall is large and well-equipped. Divided into two rooms, it has electric lights — a service that only recently reached this community. As it gets dark, farmers and their wives — many of them with children — arrive and are seated. They are serious and quiet, their unmistakably European, particularly Italian, origins reflected in their colourful clothes and fleeting conversations in their mother tongue. The group grows to about 50. Then Selina DalMoro, Director of Municipal Education in Sananduva and local coordinator for the Father Landell de Mouro Educational Foundation (FEPLAM), addresses the gathering to explain the importance of the courses that are beginning, the methodology to be used, and to thank the students for their participation.

The group then divides into two, women in one room, men in the other. Each group has an instructor who begins today's lesson by playing a tape cassette that is frequently stopped and commented on. One course is on fruitgrowing, the other on horticulture. Each is 68 hours long, and classes will meet as often as the student's schedules allow, depending on the work in the fields. In addition to attending classes where they listen to a tape some 25 minutes long and to the instructors' comments, the students receive a text and exercise book. When they finish the course, they will receive an attendance certificate.

The Sao Paulo cassette school is one of hundreds like it in the state of Rio Grande do Sul, each of which has 25 to 35 students led by a monitor or teaching assistant.

Many adult education organizations in Latin America use the mass media. Most of them are directed by religious organizations or are affiliated to churches. FEPLAM may be the only exception, although it bears the name of a priest, Father Landell de Moura, a noted Brazilian scientist who patented a radio transmitter before Marconi. The foundation has borne his name since 1967, two years after its establishment in the town of Porto Alegre. Originally called the Educational Radio and Television Service (SERTE), it was created as a result of an agreement between the Ministry of Education and Culture of the Brazilian government and the Secretariat of State for Rio Grande do Sul state.

The use of "tele-education" originated and developed in Latin America where the mass media, particularly radio, offer the only possibility of reaching isolated rural populations

(see *Reports* Vol. 7, no. 2). FEPLAM had begun using available mass media to complement ongoing adult education efforts in rural and urban areas even before the concept gained popularity on the continent.

FEPLAM's goals are to "conduct educational and cultural extension programs aimed at human development, both as individuals and members of society; to make better known the importance of educational broadcasting as a development tool; and to encourage the efforts being made to improve educational broadcasting techniques". FEPLAM meets its objectives through the selection of the courses, the adaptation of the curriculum to radio, television, cassettes, slide/sound shows and printed materials, and the production and programming for these and other media.

Its status as a private, nonprofit foundation gives it great flexibility in managing resources available at state, private, and community levels. It also benefits from a ministerial decree that stipulates that radio and television stations must devote five hours a week to educational programming, to be broadcast during prime time.

Although FEPLAM currently employs 120 people — 2 of which are agronomists — it also draws on municipal and community organizations to promote and organize its rural education courses and to adapt them to local needs. By efficiently exploiting local resources, FEPLAM is able to keep the cost per student very low: in 1978, for example, the cost per student enrolled in rural education courses was 488 *cruceros* (approximately US\$20), and in rural development courses, 130 *cruceros*. The courses are also technically and financially supported by at least 12 state and private agencies, and are linked to several international organizations, such as IDRC, for research purposes.

Through the various media, FEPLAM offers general educational courses, civics and social studies, career guidance, and rural development courses. This last type of program began later than the others but has become so popular that it is now FEPLAM's principal activity. Between 1972 and 1978, more than 112 000 farmers have followed the rural development program, begun in 1972, and the training program begun in 1974.

The students taking these courses are for the most part men — adolescents and adults who either have not had any schooling, or who left school with only a primary education. Small landowners and farm workers, they are at least 16 years old and have a basic knowledge

of writing and reading. The population covered by the program is concentrated in the northern part of the state where small farms predominate.

Of the 16 different courses offered in the 1978 training series, the course on soil conservation was the most popular. The teaching methodology has been adapted to the needs of the participating students. Students can work either individually at home, or in groups, complemented with class meetings. Home learning materials are also provided. Their rural development series is now being broadcast by commercial radio stations: the programs last 15 minutes and the stations can choose from up to 70 different subjects.

To date, it has been difficult to measure the effectiveness of FEPLAM's services in terms of the adoption of new technologies or changes in behaviour that lead to greater productivity and economic well-being. With IDRC support, it has now launched a research project that seeks to measure behavioural changes as a product of its communications program.

Four regions in the state have been selected for the study: two for the experiment and two as control areas. In the first two regions, FEPLAM is offering new rural development programs. One offers technical advice on the production of potatoes, cassava and beans, concentrating on low-technology and labour-intensive methods. Because these crops make up the basic diet of the small-farm family, the course addresses the most significant items in the life of the target audience. The second course deals with cooperatives and is therefore much more concerned with the sociological behaviour of farmers.

The study will test the hypothesis that participation in the courses will change the behaviour of farmers, by changing their planting practices and by their degree of participation in cooperative activities, such as the maintenance of cooperative storage facilities.

This is the first attempt in Brazil to measure the effectiveness of tele-education in terms of its broad practical effects. And because of the popularity of mass adult education programs in Latin America that aim to influence the behaviour and attitudes of rural populations, this project will be of great interest to other organizations and countries concerned about the causal relationship between educational programs and subsequent behaviour. □

Something ventured, something gained

German Gutierrez



Photo: Jaime Rojas

The subsistence farmer is extremely important for the world: he produces food for almost half of the world's population, and works about 40 percent of all cultivated land.

In Colombia, as in most developing countries, small farmers make up almost three-quarters of all farmers, but own less than eight percent of the farmland. Their main problems include low income levels, limited access to credit and to modern inputs, deficient marketing channels, an imbalance between the cost of inputs and the prices obtained for the products, and a dearth of information on farm technology that has been tested and applied in their region.

In order to raise these farmers' living standards and production levels, researchers throughout the world have recently been seeking ways to increase the agricultural output of land currently in use through the application of new technology — a base-up approach. Following the limited success of several agricultural development policies, the Colombian government, through the Colombian Institute of Agriculture (ICA), began in 1971 to apply this approach to its rural development projects. One of the first such projects began in Caqueza, a region located in the eastern part of the Department of Cundinamarca, an area where small holdings predominate. During the first few years of the project, IDRC provided technical and financial assistance.

The methodology used in the project involved accelerating rural development in the area and raising the standard of living of its inhabitants through the creation of a new farm technology that would increase the production per hectare of the region's most important crop: corn. For generations, Caqueza's small farmers employed traditional technologies and obtained, on average, yields of 907 kilos of corn per hectare which generated a net income of US\$57.

The research conducted on the new corn technology incorporated the farmers' traditional methods and took into account their physical and institutional constraints. After more than 30 experiments and two or three replications, a comparison of results between the experimental and the traditional systems revealed that under the new system, production per hectare increased by 202 percent, and net profits by 253 percent. Returns from labour and land use rose by 73 percent and 155 percent, respectively. Although the new technology required an almost sevenfold increase in investment over the traditional system, the return on the capital invested grew by 58 percent.

In 1972-73, as the new corn tech-

nology spread, economic and other factors were observed in Caqueza, which, at the regional level, hindered the adoption of the new technology. Increasing production and the greater use of fertilizers and pesticides, for example, required more manpower — often not available. Several of the methods recommended in the new technology raised the cash outlay, and were therefore rejected by the farmers. Although credit was available at the nominal interest rate of 13 percent, its real cost varied between 36 and 56 percent annually, which limited its use. The effect of variables such as climate, crop pests, and market and institutional conditions also meant that the returns were not assured. The new corn technology therefore involved risks beyond the farmers' control, whereby the potential high returns were offset by a great variability of profits.

The new corn technology was therefore reformulated to promote its adoption. Despite the adjustments made, studies carried out on the adoption rate revealed that when the farmers used credit but received no technical assistance, the rate of adoption barely exceeded 20 percent. When credit included technical assistance, the adoption rate tripled, but was still low. The obstacles to adoption were not evident, but studies showed that farmers who adopted only part of the new technology obtained poorer results than those who continued using traditional technologies.

Four risk measurements of the new corn technology were carried out at the beginning of 1974. It was found that the risk of production increased with the increased cost of production and with an increased variance in the value of production obtained. It was concluded that the small farmer resisted adopting the new corn technology because of its high initial cost and the risk connected to the investment. A strategy therefore had to be found to overcome these constraints.

In 1974, the Caqueza project introduced a risk-sharing plan whereby the project shared the risk with the farmers who wanted to use the new technology, assumed the initial input costs, and also shared in the profits and losses. A minimum subsistence level of 800 kilos per hectare was set to enable farmers to meet their needs.

If the yield per hectare fell below 800 kilos, the farmers did not pay the project for input costs. If the yield was between 800 and 1600 kilos, the first 800 kilos belonged exclusively to the farmer who also received half of the excess. The project received the other half to cover the cost of inputs and

technical assistance. Everything over 1600 kilos belonged to the farmer.

By comparing the results obtained with the new corn technology in the risk-sharing plan, and those obtained without risk-sharing, it was found that although production and net profit per hectare fell by 35 and 18 percent respectively, the probability of total costs exceeding total income decreased by 70 percent. One of the prime objectives of the project was therefore achieved — risks were distributed.

In 1975, after this risk-sharing plan had been widely implemented, all participating farmers adopted 95 percent of the new corn technology package. Since then, the risk-sharing plan introduced for corn production in Caqueza has become a means of teaching the new technology and an effective extension agent. It has been observed that the farmers, after participating in the risk-sharing plan for two years, continue to use the new technology by themselves assuming all the costs and risks. A similar plan was designed in 1975 for onions — the most profitable horticultural crop in the region.

Since 1976, the risk-sharing methodology developed in the Caqueza project as a means of increasing the adoption of a new farming technology has been recommended nationally. One of the first replications was started in the Department of Santander for growing sugarcane. Similar plans have also been employed in the Department of Tolima and Cundinamarca for sugarcane, and in the Department of Cauca the risk-sharing program was introduced to extend farm technologies for the cultivation of tomatoes, cassava and peppers. In the Department of Narino, the system is applied to peas and cassava crops.

To date, 30 risk-sharing plans using the methodology developed during the Caqueza project have been implemented in Colombia. And although there is not yet enough information to evaluate the social and economic impact of these programs, the growing demand for the risk-sharing schemes in small farm areas is a clear indication that the research work and the experience acquired in Caqueza have been crucial, both in terms of understanding the farmers' behaviour towards new farm technology, and of promoting policies that benefit Colombia's small farmers. □

German Gutierrez, agricultural economist, was an IDRC research assistant to the Caqueza project. He subsequently received an IDRC post-project award to complete his master's degree in Canada. Caqueza: living rural development has recently been published by the Centre (see page 27 for details).

The rush to the city

Susana Amaya

Why do people migrate to the city? Answers to this important question emerge from a series of studies carried out in developing countries during the past decade. An IDRC Migration Review Task Force recently reviewed these studies in order to relate the findings to the process of economic development and assist in the development of new policy-related research that may help developing-country planners deal with internal migration. Some of the trends revealed by the research conducted in Latin America are summarized in this article.

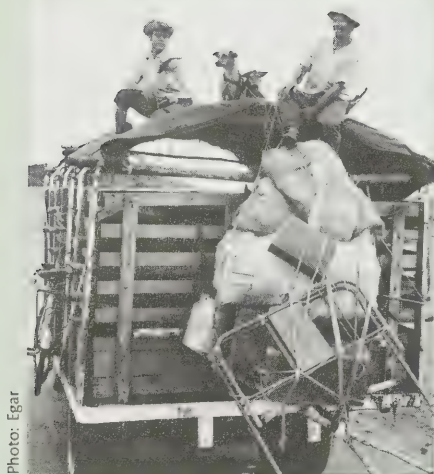


Photo: Eggar

Findings of the Migration Review Task Force have been published by IDRC under the title Social change and internal migration. A review of research findings from Africa, Asia and Latin America (IDRC-TS62), and in Spanish as Cambio social y migración interna. Una resena de hallazgos investigativos (IDRC-TS105).

Internal migration in developing countries is a highly visible problem. In fact, 65 percent or more of the adults in many of the large expanding cities of these countries are migrants from rural areas. The problems resulting from this movement are numerous: the circles of slum housing around the city, the cost of extending services to ever-growing suburbs, water shortages, and a general administrative confusion because of overlapping political jurisdictions.

The fact that a high proportion of the "problem" population in the slum area may be migrants with little education and of poor rural origins has reinforced stereotypes that all migrants to the city are of poor farm backgrounds. But is this so?

As the researchers participating in the Migration Review Task Force point out, the motivation behind migration is generally economic. Studies also show that most migrants are young adults who have higher education levels, and that the more education they have, the more likely they are to migrate to the city.

In Latin America where urbanization is well underway, the population is already more than half urban. More Latin American women migrate than men, and they generally head for metropolitan areas where work is available. Men, on the other hand, often move to distant settlements or to areas where there is seasonal agricultural work. Friends or relatives living in the cities help perpetuate the migratory flow.

Three very important economic and social factors that have traditionally limited work opportunities in the rural sector determine rural-urban migration in Latin America: the structure of landholding, low agricultural productivity, and the rapid increase of population. Technological innovations that bring about an increase in worker productivity can also stimulate migration by reducing work opportunities, and ecological damage and soil erosion due to excessive land use can cause the population to move. Another recent factor is class conflict: for example, in Colombia, the period of rural upheaval known as "the violence" that began in the 1950s sparked major migratory movements of the rural population to urban areas.

Initially, it was thought that the migrants arrived directly from their place of origin to the city. It has been established, however, that this process is not so simple and occurs in stages. It is clear that migrants do, in time, improve their economic situation and that the labour force in these areas grows as a result of the migration of young, productive people. A person with training will be able to use his ability and the untrained individual can acquire an education; migration will make social mobility easier and therefore contribute to the system's stability.

One major claim made about migration is that mainly illiterate peasants migrate to the city and crowd into slums, which become centers of social upheaval. However, no empirical evidence exists to link social and political instability to migration. Indeed, most migrants are better prepared for urban life than is generally thought, or they adapt very quickly to it — many, in fact, come from small or medium sized towns.

Although considerable knowledge has been acquired on population movements much remains to be studied, and there are important points on which future research efforts would do well to concentrate. For instance, little information exists on the effects of migration on the receiving communities and on the communities of origin, and on the impact of government policies on migration. This phenomenon has frequently been studied in isolation and not as a variable in the development process. Cyclical or seasonal migration is also little known.

Urban development in Latin America will continue to expand. The time has come, says the Migration Review Task Force, to carry out more studies on the impact of social and economic development policies that may lead to population redistribution patterns that will enhance overall development. □

Even after more than two decades of efforts by developing countries, the most basic of basic needs — food — goes unsatisfied. The hungry are still with us, and in increasing numbers.

We have the knowledge to produce enough food (grains in particular) to adequately feed our growing population. The earth's resources can support more food production. The major problem does not seem to be exhaustion, but rather allocation of resources.

Competing claims for allocations of food and inputs (animal feeds, fertilizers, energy) arise across different countries, among various groups within countries, and between competing crops, livestock, fishery, and forestry activities. Over the long haul, resource allocation involves not only increasing investments to improve food production in the "food deficit" countries, but also evolving mechanisms to assure that once food is produced, it is distributed equitably among various segments of the population.

Efforts to improve food production and distribution have fallen short of expectations due to two major factors. First, the volume of resources devoted to food production and distribution in developing countries by both the countries and the external donors, does not match the targeted requirements and is woefully below what the rhetoric of international conferences on food issues indicated would be made available. Second, even the resources that have been allocated are not focused on food production and distribution as *such*, but are dissipated among the larger agricultural or rural programs. The diminished volume of resources for food production can be explained in terms of the strength of commitment and political will. The second emerges from the state of development planning and policies.

Although every country proclaims "food first" as an inalienable right of its citizens, most do not translate it into concrete plans or programs and do not have operational mechanisms to achieve their objectives. Most plans and programs are formulated along established traditional sectoral lines of agriculture, defence, industry, irrigation, health, education, transport, and services, etc. In this framework, programs for improving food production are usually planned for in the agriculture department or ministry. Other programs for supplying needed inputs such as fertilizers, pesticides, machinery, and implements are kept in the ambit of other departments. Planning for investments in irrigation facilities, their maintenance, and regulation of irrigation water supply are traditionally handled by the irrigation ministry. Food transport, storage, and distribution involve the participation of still other regulatory and service agencies, while food trade with the outside world is normally controlled by the trade and

Commentary

Plan, then plant

M.S. Rao

finance ministries. Thus, the planning, programming, and policies for the food sector in most developing countries seem to be scattered over a host of agencies with minimal effective co-ordination.

This is in marked contrast to the experience of these countries in planning two other basic services — health and education. In both of these cases, usually a single department is in charge of the whole range of activities from planning to the final delivery of service. Perhaps this was more feasible in these sectors because the state is generally the major — if not the sole — provider of the services. In the food sector, the role of the state is not so dominant in most countries.

However, the need for significant coordination and integration of the planning, programming, and policy formulation aspects of the food sector seems paramount. This should facilitate the evolution and effective implementation of more pragmatic policies and programs to effectively meet the most basic food needs of the different segments of the population. Thus, it makes ample sense to initiate systematic planning for the food sector of a country within a single agency invested with the necessary political, professional, administrative, and financial clout.

The process of food planning, programming, and policy making could be carried out most effectively through a systems approach. It should begin with a definition of the basic goal of satisfying the food needs of all segments of the population in order to reach and/or exceed a notional or normative minimum nutritional level within a specified period of time. This implies a target annual rate of improvement in the nutritional level of the population, which could be translated into aggregate production targets by commodity, region, and population group.

The main intervening policy instruments should include inputs and production policies covering agricultural research, seed production and distribution, land tenure, acreage allocation, employment, minimum wages, credit, capital incentives, irrigation, fertilizer, and mechanization, as well as prices, taxes, subsidies, levies, and extension services. Trade policies should cover imports/exports, foreign exchange allocation, port facilities (receiving, storage, etc.), contracts with suppliers/purchasers, and food aid. A third policy area must deal with transport, storage, and distribution, including infrastructural facilities, market channels, and rotation of stocks. A final aspect, consumption policies, should deal with spatial aspects (across regions) of food consumption among population groups (men, women, children, etc.) and across income groups, and assess the impact of prices, subsidies, and other policies.

The physical, financial, and personnel aspects need to be considered carefully in formulating programs and policies. It is also crucial to plan the programs so that they will mesh well with existing ongoing activities.

Throughout the planning and programming exercise, it is essential to understand the linkage between the range of policies and programs and how these influence the incomes of the people involved — landlords, peasants, agricultural labourers, artisans, petty traders, retailers, etc. — so that they are in accord with the consumption policies allowing target groups to improve their nutritional levels. This is all the more important as more than half of the population in most developing countries derive their livelihood from activities associated with food production, trade, and distribution. Thus, a clear recognition of the forward and feedback linkages connecting production with marketing, storage, processing, and distribution, and with consumption activities is necessary.

The World Food Council reiterated the need for a coordinated food policy for developing countries in its Manila Communiqué of 1977. It recognized the lack of any "systematic and concerted action" as the greatest obstacle to eradicating hunger and malnutrition. It also recognized that "rapid economic development supported by appropriate social and economic reforms within countries will be required to overcome poverty. Nevertheless, the waste of human potential involved in continued hunger and malnutrition makes it imperative that attacking these problems cannot await the slow process of overall development." □

Dr M.S. Rao is a senior member of IDRC's professional staff. He has served as a consultant to the World Food Congress (in 1974), and with the International Food Policy Research Institute (IFPRI). He is currently advising the World Food Council on food policies and strategies.

Canada prepares for UNCSTD

J. King Gordon



Photo: Neill McKee

The Hon Rex Nettleford (left) outlines IDRC's philosophy as William Jenkins, CIDA's Vice President (Policy), listens.

Any major UN conference stirs up a certain amount of excitement among those most immediately involved. This is certainly true for the United Nations Conference on Science and Technology for Development (UNCSTD) that takes place in Vienna this August. Some of this interest is deliberately stimulated by the conference planners to enhance the significance of the conference, and to ensure its continuing impact on the global scene. Governments have consulted national scientists and technologists, industry and industrial research centres, and universities for guidance in the preparation of their national papers. And the scientific community has been encouraged to sponsor seminars that will explore some of the major themes to be discussed at UNCSTD, and give advice to the governments on the responsible stand they should assume in the UN forum.

It seemed fitting that such a seminar or symposium should be held in Canada, in May, and that its sponsor should be IDRC in association with the Royal Society of Canada, SCITEC, and the Association of Universities and Colleges of Canada (AUCC). And what better venue than the Ontario Science Centre in Toronto under the direction of that very distinguished international scientist, Tuzo Wilson, who with IDRC President, Ivan Head, opened the symposium.

They came to Toronto from all ten provinces of Canada — scientists and technologists, development economists and administrators, and a few government policymakers. And they came from the five continents as well — spokesmen for the people of the Third World and representatives of international organizations. It was these latter who introduced a measure of realism into the context within which the discussions took place and brought the debate down from the esoteric levels of science policy to the basic needs of the desperately poor. They also helped to dilute that self-confident superiority that occasionally marks Canadian technocrats anxious to embark on a mission to help the underprivileged in the lands far across the sea.

What was evident from the very start was that the traditional concept of the transfer of science and technology had become outmoded. In the first decades after the war, because the great reservoir of development power was concentrated in the industrialized world, it was believed that all that was necessary was to install and set in motion transmission belts that would carry technological resources to the primitive lands to provide their inhabitants with the means to lead a civilized and affluent life — like us. Behind this was a charitable urge to help the poor and a sublime faith in technocracy as a panacea for human poverty and suffering. It took some time for the dawning of a realization that such an approach contained large elements of colonialism, resulted in the perpetuation of an economic and cultural dependency, tended to serve the interests of an elite in developing countries, and, for the majority of the poor, just didn't work.

Jorge Sabato of the Bariloche Foundation in Argentina pointed out that the transfer and application of science and technology was a much more complicated process: it had to take into account not only economic and industrial objectives but the broad social, cultural, normative, and even spiritual goals of the society determined to create a better life for its people. Science and technology could not be separated from national policy, just as national development policy had to perceive science and technology as relevant components. He also stressed that the ill-balanced relationship between North and South made dialogue and cooperation difficult, but negotiation necessary. And he affirmed that an essential element in any cooperative relationship was the building up of a scientific and technological capability in a developing country.

There were obstacles to the achievement of such a goal. These were outlined by Anton Zahlen of the Advisory Committee on the Application of Science and Technology to Development (ACAST) as falling into four principal categories: those inherent in the coun-

try itself; those inherent in the technology itself; external obstacles based on the superior power of advanced countries, the costs of technology, and the paramount position of transnational enterprises; and obstacles in the interface between North and South having to do with human relations, language, financing, laws, etc. None of these was insuperable but the approach to them had to be seen as part of the negotiating process and ultimately of co-operation.

Vadakan Vinyu, Director of the UN Asian and Pacific Development Institute in Bangkok completed the assessment of the contemporary international scene with a reminder that technology cannot be considered culturally neutral, and made a strong plea for the development of indigenous science and technology adapted to the resources and to the cultural as well as the socio-political needs of the Third World country.

Against this world background the symposium turned its attention to the Canadian experience and the Canadian resources for science and technology in development. William Jenkins, Vice-President, Policy, of the Canadian International Development Agency (CIDA), spoke about Canada's international assistance program, directed to strengthening the self-reliance of the recipient countries. He admitted that it was possible that CIDA's program was too project-oriented; that the projects might be too much identified with a CIDA program; and that the effectiveness of any international assistance program was dependent on the project director or advisor. He indicated the extent to which CIDA drew on Canadian universities for expertise to man their projects. For the future, one should seek ways to match the needs of developing countries with Canadian capabilities.

The choice of Rex Nettleford as the spokesman for IDRC told something about the nature of the organization before he uttered a word. Nettleford is Jamaican, Director of the Department of Extra-Mural Studies of the University of the West Indies, choreographer and leading dancer in the Jamaican National Dance Theatre, and Member of the Board of Governors of IDRC. Nettleford spoke of the revolutionary approach of the IDRC with its central aim to assist in building up research capabilities of the Third World and its policies determined by an international board of governors whose Third World members were intent to bring the principle of interdependence into the pattern of relationships between the so-called developed world and the so-called developing world. This meant a change in relationship from subordination and superordination to sharing and partnership, to a free flow of ideas, to the forging of new institutional arrangements based on

partnership. And here, said Nettleford, is where the universities become important. He invited Canadian universities to take the initiative and establish organic links with sister universities in the Third World who could benefit from the contact. "That is the spirit which is present in IDRC," said Nettleford, "and IDRC is committed to facilitating that kind of partnership wherever the initiative comes from."

One purpose of the symposium was to brief the Government of Canada, which was in the process of preparing a position paper for the Vienna Conference on the opinions of the Canadian scientific community. A Canadian paper had been prepared, giving a historical account of the evolution of a science policy in Canada and Canada's participation in the international effort to apply science and technology for development. A second paper had been prepared by a committee of the Royal Society and SCITEC on the reactions of the scientific, technical and social science community to UNCSTD.

These papers, in addition to the contribution of speakers and discussants at the symposium, provided the basic substance for the three working groups discussing Canada's present and potential future international role in science and technology.

The first group representing governments and NGOs chewed over the contributions of Jenkins and Nettleford and seemed to agree that the IDRC "model" more realistically fitted into the new pattern of international co-operation for development. It showed some concern about the delay in the preparation of Canadian science and development policy for UNCSTD.

The second group — industries and industrial research institutes — surprisingly, appeared to be fairly complacent about the role of the transnationals in the transfer of science and technology for development to which a great deal of attention was devoted in two United Nations papers prepared by the UNCSTD Preparatory Committee and ACAST.

The third group, in which Canadian as well as Third World universities and institutes were well represented, appeared to make the most significant progress. They had the advantage of two very important contributions: from Richard Griffiths, Director of the British Inter-University Council (IUC) and from A.J. van Dulst, Director of the Netherlands University Foundation for International Cooperation (NUFFIC). Each described inter-university mechanisms for linking teaching, training, and research activities in British and Dutch universities with universities in developing countries. The emphasis was not so much on the enhancing of developed country research that might have relevance to Third World needs, but rather the extension of traditional academic collaboration to include scholars in developing countries whose institutions

were playing an increasingly important role in their country's development policies. There were strong expressions of opinion that previous Canadian mechanisms were inadequate and that satisfactory procedures for involving Canadian scholars and researchers, having regard to effective and continuing links, were mainly lacking. Considerable hope was expressed that the new AUCC International Development Office under the direction of Michael Oliver might be given the necessary support from both universities and government funding agencies to play a similar role to IUC and NUFFIC.

Two presentations on the final morning of the symposium had an important impact on the working groups and their deliberations: a description of the orientation and activities of the Swedish Agency for Research Cooperation with Developing Countries (SAREC) by G. Richerts, Scientific Counsellor of the Swedish Embassy in Ottawa, and Princeton Lyman's account of the new Institute for Scientific and Technical Co-operation of the United States government. Both stressed their role in enabling the scientific and technological community of their countries to collaborate with Third World institutions in strengthening research capabilities. And both suggested that it was along these lines that their governments would indicate increased support of the UNCSTD objectives.

In endorsing such a position, members of the working group on the involvement of universities and institutes felt strongly that here was a positive initiative which might be taken by the Canadian delegation to Vienna.

A symposium, quite apart from its formal program, provides a meeting place for like-minded searchers after truth, for exchanges of views, for the opening up of new doors and windows. The person-to-person relationship in the symposium kept all participants close to the central object of the whole big UNCSTD enterprise in which Canada must play a significant part. That central object is the condition of man, the dignity of man, the creative potential of man. And this was what that great Canadian scientist, Omond Solandt, was really saying when he spoke at the dinner and reminded his colleagues that the quality of life as a goal of science and technology was what counted. □

J. King Gordon is Senior Advisor, University Relations, in the office of IDRC's Senior Vice-President, Louis Berlinguet. Dr Berlinguet has been an active member of ACAST that has brought to bear the views of the international scientific community on UNCSTD's immediate and long-term goals.

BRIEFS

POTENT PESTICIDE PRIZEWINNER

A team of British research workers from Rothamsted Experimental Station recently won the Unesco prize for "advances in science of particular use to developing countries" for their work in developing a new group of insecticides.

The potency of the insecticides is not reduced by light and air, they are readily metabolized if swallowed by mammals — hence nonpoisonous to humans or livestock — and, as they are biodegradable, do not pollute the environment.

The new products are the results of a long-term research project investigating the relationship between the molecular structure and insect-killing properties of pyrethrin-type compounds. Pyrethrum is a daisy-like flower that has long been used as a source of potent nonpoisonous insecticides known as pyrethrins. The new series of insecticides are synthetic compounds with improved characteristics. One of the series, *decamethrin*, is the most active insecticide known.

Although synthetic pyrethrins have some drawbacks — they can kill beneficial as well as harmful insects, and are toxic to fish — careful application can minimize these effects. Weighed against these drawbacks is their great promise for control of insect vectors of diseases such as malaria, yellow fever, and sleeping sickness, and the pests of a host of food and cash crops.

SWINE FEVER THREATENS — AGAIN

For the second time in ten years, the pig industry in the Western Hemisphere is threatened with crippling losses as a result of the onslaught of African swine fever. According to information issued by the North American Liaison Office of FAO, Brazil and the Dominican Republic have been hit directly, while Argentina, Bolivia, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela have begun efforts to block transmission into their territory. Haiti has also reported outbreaks.

African swine fever is a virulent disease causing high death rates

in pigs. No vaccine or treatment exists, and the only methods of control are to destroy all infected animals, bury the carcasses, disinfect affected areas, and apply quarantine measures. Human beings are not at risk.

The disease, caused by a virus, first broke out in the west in Cuba, in 1971. The present outbreak is believed to have been introduced through infected leftover food from commercial airlines' passenger meals, which instead of being properly disposed of, was apparently fed to pigs.

FAO and the Pan American Health Organization convened a technical conference in Peru to recommend action for controlling the disease, and FAO's Technical Cooperation Program granted \$1 million to establish laboratory and technical facilities in 11 countries. Swine producers are urged to ban the use of food scraps from hotels, restaurants, and markets as pig food unless properly cooked, to control pig movements and marketing, and to maintain strict surveillance of swine disease in risk areas.

BURYING GRAIN IN BUNKERS DOWN UNDER

In developing countries, crop storage on the farm is an important part of the traditional farming system. It is essential both for conserving seed for the next planting, and for stockpiling staples to feed the farmer, his family, and livestock. Sound storage practices (in combination with proper crop preparation beforehand and monitoring while in the store) can help cut the often heavy losses suffered after the harvest is gathered.

Scientists at the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia have "rediscovered" and improved an effective, low-cost method for wheat storage first used by ancient Egyptians.

The basic technique involves burying the grain in earth-covered bunkers. The merits of the system are that it has a lower capital cost than currently used storage systems, can be carried out at the farm or community level, and protects the harvested crop against rain and floods, theft or pilferage. But the most important advantage is that this form of storage avoids damage by rodents and insects.

The grain is stored in well-drained, shallow rectangular bunkers that

are first lined with heavy black plastic sheeting. The grain is covered with plastic and sealed before a layer of sand, then a metre of soil, is put on top. Developed for emergency or surplus storage in Australia, the technique may have application in developing countries as well. (CSIRO, P.O. Box 225, Dickson A.C.T. 2602, Australia)

A BLENDING OF MEDICAL MERITS

There are few physicians in the rural areas of developing countries, and the ratio of village health workers to population is often on the order of one to 10 000 or more.

The tens of millions of people in rural areas of developing countries turn, as they have for generations, to traditional healers, birth attendants, or herbalists for their health care. Recognizing that traditional healing systems and practitioners represent a "rich legacy of ancestral experience" — and may probably be the only practical solution to the delivery of primary health care on the mass scale required — the World Health Organization (WHO) has proposed stepped-up efforts to promote traditional medicine programs, who will foster a "synthesis of merits", seeking ways to assist developing countries to integrate the best of modern with the best of traditional medicine.

One of the measures recommended in a WHO report outlining the program is the establishment of a dialogue among practitioners. Other recommendations include firm decisions being taken at the national level to support traditional medicine, verification of claims made for treatments and herbs, and technical support.

CHARGED WITH ENERGY INFORMATION

Renewable sources of energy — solar, wind, and biomass — have the potential to meet a good portion of the energy needs of developing countries. One of the difficulties of realizing this potential has been the lack of information on renewable energy technologies specifically for the tropics.

The establishment of the Renewable Energy Resources Information Center (RERIC) at the Asian Institute of Technology (AIT) in Bangkok, Thailand, is a step towards overcoming this difficulty. RERIC was founded in May 1978 on the recommendation of a meeting of regional and international energy experts. It was given the task

of collecting and disseminating appropriate materials, and offering a variety of information services for users in the Asian and Pacific region. The center will initially concentrate on solar energy, and later expand its operations to include biofuels, wind, and small-scale hydropower. Emphasis will be on applications of technologies to rural development needs.

As part of its program RERIC has recently published a collection of abstracts of reports and publications resulting from research undertaken at AIT on renewable energy, as well as a newsletter filled with items on projects, new equipment, publications, and forthcoming events. The first issue of *Renewable Energy Resources Review Journal* also appeared in May, featuring longer state-of-the-art reviews designed to fill the gap that exists between the "back yard workshop" type of magazine and the advanced technical journals.

Inquiries on the range of RERIC services and activities should be directed to Dr Jacques Valls, Director, RERIC/AIT, P.O. Box 2754, Bangkok, Thailand.

POTATO PUREE PROVES PALATABLE IN PERU

A team of physicians at Peru's Nutrition Research Institute are testing potatoes to feed malnourished children. "A potato formula is less costly than milk and suitable for children with malnutrition", according to Dr William MacLean, Associate Director of Research at the Institute.

Malnutrition is often accompanied by complications in the gastrointestinal tract, requiring that children be fed easily digestible foods. Researchers have been testing the role of the region's staple foods, including potatoes, in rehabilitation diets since 1976.

Children, usually between three months and one year of age, are fed formulas in which potatoes provide 25, 50, and 75 percent of calories, and up to 100 percent of protein. Blenderizing reduces the bulkiness of the tubers, and additional fat, carbohydrates, and a vitamin and mineral mixture are added.

The potato formula has been tested to determine the amount a child can consume, fat absorption, maintenance of adequate serum proteins, acceptability and tolerance. The potato is favorable in all these factors, said Dr MacLean, and the quality of its protein very high. However, there remains research work to be done to improve the digestibility of potato carbohydrates before the potato formula can be wholeheartedly endorsed.

Climate: change is in the air



Rowan Shirkie

Weather. Everyone complains about it, but nobody does anything.

It touches all our lives, and the climate has a profound effect on the nature of life on the planet. Weather and climate are different things, however. The first is a local phenomenon — the daily rainfall, sunshine, or wind — caused by changing atmospheric conditions that last for only a few days or weeks at most. Climate is a general pattern of weather over a period of time.

At one time, climate was assumed to be “average weather”. It was thought that if enough observations could be made over a period of 50 years or so, an average value could be produced for each of the elements comprising climate — rainfall, temperature, barometric pressure, etc. — an average to which the climate would always tend to return. It is now recognized that there is no “climatic normal”, and that climate is always changing, on a variety of timescales.

On one timescale — a 100 000-year cycle of variations in the earth’s orbit — we are moving toward a new ice age. In fact, human civilization as we know it has arisen in a brief “hiccup” of mild conditions about 20 000 years long between ice ages. We are relatively close to the end of that present interglacial now, it will last no more than another 5000–10 000 years.

Over a much shorter timespan, two natural processes are currently believed to alter the climate: volcanic dust, and sunspots.

Volcanic dust, thrown high into the stratosphere from eruptions, is believed to act as a sort of sunshield, blocking the heat of the sun from reaching the earth’s surface. When Krakatoa, west of Java, erupted explosively in 1883, it spewed an estimated 53 cubic kilometres (13 cubic miles) of dust into the stratosphere. It produced spectacular

sunsets around the world, and may have helped to keep the 1880s cooler than the previous two decades. To achieve a long-lasting and significant effect, a number of volcanoes erupting over a period of years, or even centuries, are needed. Such an upsurge in volcanic activity has been experienced recently, and the trend has become pronounced in the 1970s.

Astronomical speculation has lately suggested that the heat of the sun itself may vary on a timescale as short as a decade. Sunspot activity, now projected on a roughly regular cycle of 11 years, may be an indicator of changes in the actual temperature of the sun. A change of no more than one percent in the solar constant is sufficient to produce

substantial changes in the earth’s climate. Researchers comparing historical records of climate and sunspot activity have found that variations in periods of warm or cold conditions coincided with variations in sunspot activity.

Interpreting the climatic consequences of increased volcanic activity in the 1970s, combined with a general decrease in the sun’s activity as indicated by diminishing sunspot activity, climatologists believe that the trend of the next 20 years is towards cooler, drier, and more erratic weather.

But while it may be true that everyone complains about the weather, it is not true that nobody ever does anything about it. We are, perhaps unconsciously, altering our climate in a very real way — unfortunately, for the worse. There are two main human effects on climate, the “human volcano” effect, and the “greenhouse” effect.

The human volcano effect is produced by the injection of dust and particulate matter into the atmosphere by industrial pollution, windblown soils from farmland, and other activities. As with the natural volcanic effect, this may be acting to block heat from the sun. Another striking variation of this effect has recently been observed on Kenyan tea plantations. Researchers believe that the violent hailstorms that cause massive damage to plantations each year may be seeded by the planters themselves! Fine particles of tea litter, stirred up by the activities of tea pickers, are easily drawn up into thunderheads to form ice nuclei and promote hailstones. Tea litter has been shown to be more effective in producing precipitation in this way than silver iodide, the chemical conventionally used to seed clouds.

The greenhouse effect is produced by the buildup of atmospheric gases, primarily carbon dioxide from burning fossil fuels, and the reduced natural forest cover (which, as the “lungs” of



Photos: Neill McKee

A good harvest — or any harvest at all — depends a great deal on the weather. Unfavorable conditions are currently reported in over 20 countries.

the planet, scrubs carbon dioxide, and produces oxygen). The carbon dioxide is thought to act as a blanket trapping solar heat and warming the earth ... in much the same way as glass in a greenhouse. Some climatologists have warned that if the carbon dioxide levels continue to increase, they will produce a global warming within the next generation that may temporarily override the longer term cooling.

Humans can also seriously affect climate in other ways: depleting the ozone layer through the use of aerosol propellants, supersonic aircraft, and other chemicals; diverting Siberian rivers, which may result in the melting of the polar ice cover; altering evaporation and water balance by the increasing use of rivers for irrigation; and by deforestation, agriculture, and the creation of large artificial reservoirs that directly affect the planet's reflectivity and, therefore, the absorption of solar heat.

Scientific opinion on the climate is as uncertain as the weather itself. Some hold that the greenhouse effect produced by carbon dioxide and other gases will dominate climate in the future, producing global warming and a "Little Tropical Age". Others believe that the effect may somehow be just the opposite, and that some processes will lead to a cooling rather than a warming of the atmosphere.

Whether a warming or a cooling, climatic change cannot be separated from other global environmental problems: increasing population, with growing pressure on food, energy, water, and other resources.

In spite of technological advances, the human population today is more vulnerable than ever before to climatic change. Some believe that civilization is "on a knife edge". An exceptionally stable and warm period in the global climate from 1910 to about 1960 — the most unusual 50-year run of weather for which records exist — is now over. The good weather occurred at a time when human population was beginning its rapid expansion, and great efforts were being made to increase agricultural production to support it. With the 1960s, climate began to conform more to what appears historically "normal". Cooler, drier, more erratic weather should predominate for the next 20 years, at which time the greenhouse effect may have begun to exert its influence.

The most immediately important consequences will be on agriculture, particularly in the most vulnerable areas of the sub-humid and semi-arid zones on the margins of the great deserts of Africa and Asia. Regions that depend on a single rainfall, such as the monsoons, are gravely at risk. The droughts in the Sahel that made headlines in the mid-1970s continue even now. The FAO (Food and Agriculture Organization) global information and early warning system on food and agriculture reports currently unfavourable food

The semi-arid zones, where ecology rests on a fragile balance of climatic conditions, will be the first affected by change. Drought already struck this area of Senegal in the early 1970s and once again threatens.



crop conditions in 21 countries. These poor crop prospects are due mainly to drought. In southern Africa, 10 countries are threatened by a severely reduced production of maize and sorghum — the staple food crops — because the rainy season that normally gathers intensity around November was delayed until mid-January. In several countries, crops are beyond recovery. Food shortages could develop later this year or early in 1980.

General cooling and the increased ice cover at high latitudes have caused the general pattern of atmospheric circulation to shift. During the "warm" middle part of this century, the prevailing westerly winds followed a fairly regular path within a narrow band of latitudes, bringing changeable weather and high rainfall across Europe and North America. Tropical wind patterns extended fairly well into northern latitudes, bringing with them the monsoon rains. With the change in circulation, the westerlies have slowed and become more irregular, tracing a looping pattern that extends depressions further south, bringing more rainfall, for instance, to the Mediterranean coast of North Africa and the Middle East. However, this pattern also squeezes the tropical winds towards the equator, so that the monsoon rains do not extend so far north. Rainfall decreases over the Sahel, Ethiopia, and northwest India are part of this new pattern.

From 1968 to 1973, drought affected 20 million people in a region stretching from Cape Verde across Senegal, Mauritania, Mali, Upper Volta, Niger, Chad, and the Sudan, reaching across the region known as the Sahel and into Ethiopia. The rain-bearing summer winds that penetrate north into the region had failed. The Sahelian monsoons' northern penetration can vary from year to year by about two degrees latitude. During the 1950s, a good year brought them as far north as 22°; in a bad year, to about

20°. In the late 1960s, a run of bad years saw the rains reach only about 20°N in a good year, 19°N in a bad one.

Although the rains returned to the Sahel in 1974 and 1975, they only reached as far north as during moderate years in the 1950s. Since then, the pattern of fluctuations has remained more or less the same, but shifting southward: "good" years are now no better than the poor years of the 1950s.

The drought in the Sahel was worsened by human actions: overgrazing by livestock, deforestation, and soil cultivation in areas too arid to be safely ploughed. Poor agricultural practices and inadequate land management destroyed the resilience of the ecological system to withstand the additional stresses of climate.

The world's agricultural base appears to be narrowing, with the USA and Canada becoming virtually the only significant food grain exporters. If present trends continue, the world will come to depend more and more on North American food exports. Climatic disaster here could mean famine for people around the world. The risk is growing: intensified agriculture based on relatively few food crops (five crops — wheat, rice, maize, potato, and barley — make up 61 percent of world food crop production) has increased the vulnerability of agriculture to adverse climatic change.

Climatic change, whenever it occurs, is a real cause for concern in areas where food resources are insufficient. The shifting balance of the world food market has changed much of the character of food shortages. A famine used to be a situation where no food was available in a region, and people starved. The famines of the 1970s have been different. Even in the worst areas, food was available but distribution problems were such that those who were starving had no access to food, or were unable to afford it. The need for a world grain

reserve — stores of food grains stockpiled during years of good harvests, to be held for distribution to cover deficits occurring after bad harvests — has recently been dramatized by some climatologists in their call for a "Genesis Strategy", the strategy drawn on the biblical account of how Joseph warned the Egyptians of the need to store up grain in seven good years as a reserve to eat in the seven lean years he prophesied would follow. The new lean years appear to be coming.

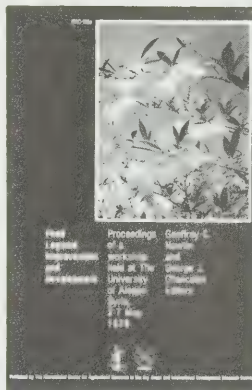
What can be done about the weather, about climate? There appears to be really only two things. First, we must increase our understanding of these natural phenomena, strengthening the capacity — especially in the Third World, where agricultural development is most important — to gather and interpret information on climate. Such a plan of action was given prominence in the declaration of the recent Conference of Experts on Climate and Mankind, convened in Geneva by the World Meteorological Organization (WMO). The conference underlined the need for more assistance to the Third World through training and the transfer of appropriate technologies, without which they cannot participate fully in the World Climate Programme, an international monitoring and forecasting system coordinated by the WMO.

Second, based on a better understanding of climate and its mechanisms, we can prepare for the changes that all agree (although disputing their exact form) are to come, through such means as broadening the world's agricultural base, and establishing adequate food reserves. In short, restoring something of the flexibility and resilience of the human and natural environment to ensure it will stand the stresses of the future.

And as Robert M. White, of the USA's National Academy of Sciences, put it in his keynote address to the World Climate Conference, the international community must change its perception of the climate. The climate is a resource, and like any other, one that is not equally distributed. Some nations and communities are well-endowed. Others are not, and access to the climatic resource is restricted by national boundaries, property rights, and political constraints. Increasingly, humans — or particular national groups or interests — can effect the distribution of the resource. The use of fluorocarbon aerosols, the burning of fossil fuels, the clearing of rain forests, or the construction of power plants can and does, accidentally or deliberately, affect the way in which other communities or nations share in climatic resources.

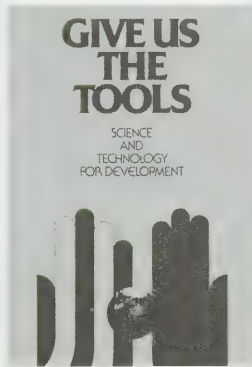
"For certain purposes," said White, "we must put climate alongside such global commons as the deep seabed and outer space as a concern of mankind for which new international obligations must be derived." □

New Publications



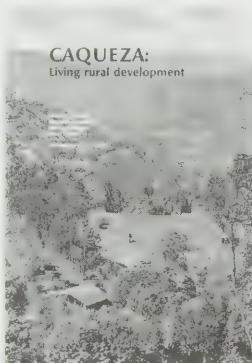
Food legume improvement and development: proceedings of a workshop held at the University of Aleppo, Aleppo, Syria, 2-7 May 1978, G.C. Hawtin and G.J. Chancellor, editors. Published in June 1979, 216 pages, IDRC-126e.

The compilation of 41 workshop papers on food legume production in the Middle East and North Africa, this publication discusses agrobioclimatology and cultivation systems, nutritional value, and composition of food legumes. Plant protection, diseases, weed control, and plant breeding and genetics are also dealt with. A list of participants and an extensive bibliography are included.



Give us the tools: science and technology for development, D. Spurgeon, editor. Published in May 1979, 190 pages, IDRC-131e.

Authored by distinguished Third World development professionals, this publication is the account of a unique experiment in development cooperation ... in effect the story of IDRC. The book draws on the experience gained in research projects in various disciplines to indicate that the approach pioneered by IDRC — strengthening the scientific and technological capabilities of developing countries — is an effective, sustainable method of development. Introductory chapters detail IDRC's creation, philosophy, and functioning, and are followed by 11 case studies that represent a cross-section of the accomplishments of developing country researchers.



Caqueza: living rural development, H. Zandstra, K. Swanberg, C. Zulberti, and B. Nestel, foreword by Josué Franco. Published in June 1979, 324 pages, IDRC-107e.

Not a textbook on rural development, but rather a case history describing the successes and failures associated with the process of establishing a flexible agricultural research methodology, this publication examines the methodology tested and the extent to which new production technologies were adopted by small farmers.

For information on these and other IDRC publications, see announcement on the back cover of this issue.

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The IDRC

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DOSSIER:
DEVELOPING CITIES

Cover photo: Jack Redden. In search of a better life, rural migrants flood into the cities of the Third World. Too often they find only unemployment and substandard housing in squatter settlements devoid of basic services. Starting on page 11 we look at some of the problems, and some of the solutions.



The IDRC Reports, and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division.

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Contents

- 3 Tropical moist forests: we all gain or lose together**
Norman Myers reports that moist tropical forests are as vital a resource as petroleum — and as threatened.
- 6 Rural women, working women**
Development programs have paid scant attention to women and households. Eleonora Cebotarev and Stella de Feferbaum explain how this must change.
- 8 Health aides make themselves heard**
Community health aides in Jamaica are not just another category of nurse, as Michelle Hibler reveals.
- 10 IDRC: new focal point**
IDRC President Ivan L. Head outlines how cooperation between Canadian and Third World scientists will be increased.
- 11 Dossier: developing cities**
People migrate from the countryside to the city hoping to escape the problems of development. Often, they find they have only changed problems. This dossier explores some of the aspects of urban development in the Third World.
- 19 Information develops an international outlook**
Jean-Marc Fleury attended a meeting of international documentalists and files this account.
- 20 Rattan: tremendous scope for use and research**
Scientists turn their attention to the preservation of rattan palms, as Michael Graham reports.
- 22 Briefs**
People, projects, events
- 24 Pods of protein**
Bob Stanley reviews a new film on cowpeas.
- 25 Commentary**
The international agricultural research system is not overgrown says Dr Omond Solandt.
- 27 New publications**

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We all gain or lose together

Norman Myers

Tropical moist forests are by far the richest ecological zone on earth. They are also the least explored by science: we now know more about certain patches of the moon's surface than we do about many parts of these forests. Furthermore, tropical moist forests are being over-exploited and generally degraded more rapidly than any other biome (ecological community). Many authoritative scientists believe that, by the end of the century, much of the biome will have been reduced to impoverished remnants — if not destroyed altogether. The present rate of destruction for the approximately 9 million km² biome is put, very roughly speaking, at somewhere in the region of 150 000–250 000 km² per year. True, many observers believe that by the year 2000 there will remain large blocks of little-disturbed forest (especially in the Zaire Basin and in the western sector of Brazilian Amazonia) and that substantial areas could survive until well into the next century. The actual rate of decline, and the prospects for the future, are matters of much controversy.

Also debatable is how much it all matters, and to whom. Who benefits from elimination of tropical moist forests, and how does it affect other people's hopes for a better life in other ways? Should we try to conserve the forests as an absolute end in itself, or should we aim to do what we can within a broader context of trying to improve long-term human welfare in all directions?

In facing these questions, we need to look at tropical moist forests as natural resources that can meet many needs, both short-term and long-term, of the countries where they are located. Because of the many goods and services that they make available to countries outside the tropics as well, we need to consider them as a legitimate interest of the entire community of nations, both now and forever.

At a casual glance, an active agent in excessive exploitation of tropical moist forests often seems to be the on-the-spot logger. Extracting 60–100 m³ of timber per hectare in Southeast Asia, for instance, he leaves behind a forest where between one-third and two-

thirds of the residual trees are damaged beyond recovery. In short, he leaves behind a basically different kind of forest, and a pretty impoverished one at that. Yet it is a mistake to think that the developing countries in question are the only parties responsible for this logging damage.

For one thing, much of the exploitation is carried out by transnational timber corporations based in North America, Japan and Europe. These corporations supply the capital, skills and technology without which Indonesia, the Philippines, the Ivory Coast and many other countries would not be able to exploit their forest resources at such headlong rates. More important, the timber harvesters are responding to marketplace incentives that stem from affluent nations. During the past 30 years, there has been a steadily growing demand on the part of the developed world for the kinds of timber that make up over 90 percent of tropical moist forests: hardwoods and specialist timbers that are favoured for housing construction, fine furniture, plywood, veneer, and particleboard. In 1950, the developed world imported 4.2 million m³ of tropical hardwoods, and in 1973, 53.3 million m³; they are projected to take as much as 95 million m³ by the year 2000. Of course, tropical countries themselves use a lot of hardwood timber, but the amount has little more than doubled since 1950, whereas developed-world imports have increased some 15 times.

A second example of foreign-inspired exploitation of tropical forestlands is the cattle rancher, particularly in Latin America. Affluent countries are increasingly looking for beef at "cheap", i.e. noninflationary, prices. In order to meet this marketplace demand, forests in several countries of Central America and in the eastern sector of Brazil's Amazonia are being cleared to make way for artificial grasslands. During the past 20 years, Central America's beef production has much more than doubled. But the additional beef has not gone into local stomachs: almost all of the extra output is exported to the United States. A similar pattern applies in Brazilian Amazonia.



Photo: Ron Poling

The assault on tropical forests is led by logging operations that strip valuable commercial trees and damage up to two-thirds of others left behind.

A third leading figure in this scene of misuse and over-use of tropical moist forests is the slash-and-burn cultivator. Until fairly recently, forest farmers were scattered, and they could practise shifting cultivation — a style of agriculture that enabled them to make sustainable use of the forest environment. But their numbers have now increased to a point where they find themselves with insufficient space, whereupon they make intensive as well as extensive demands on forests. Local ecosystems can no longer regenerate themselves. One way to tackle the problem is to boost the sustainable productivity of a cultivator's croplands, so that there is less incentive to move into fresh patches of forest every few years. Improved agriculture requires a number of inputs, however, notably fertilizer. But because fertilizer prices worldwide have soared due to the price hike on the part of oil-producing nations, and remain high due to excessive fertilizer demand on the part of affluent nations, the forest farmer sees little prospect of improving his agricultural methods.

Such, then, are some of the "resource relationships" that operate among the global community and that contribute to the decline of tropical moist forests. In view of the "economic-ecologic linkages" between persons chopping down forests in the tropics and people living thousands of kilometres away, one may well ask "Whose hand is really on the axe?"

The decline of tropical moist forests will have many and varied consequences.

First of all, the tropical countries in question will lose a source of potentially renewable foreign exchange earnings. Their hardwood exports are now worth US\$4.5 billion per year, and are growing at a rate far faster than that for international trade in all forest products. In fact, tropical wood exports now amount to about 4 percent of the value of all developing-world exports excluding oil, making it one of the five most important export commodities produced by the developing world. At the same time, the main markets for tropical hardwoods, affluent nations — will lose the prospect of sustainable supplies of specialist timbers.

Secondly, elimination of these forests can trigger an "ecological backlash", both at a local and global level. Especially important are watershed repercussions of deforestation. Forty percent of developing-world farmers live in valleylands and so depend heavily on the "sponge effect" of forests in surrounding catchment areas. When forests disappear, rainy season supplies of water tend to be released in floods, followed by months long droughts. In parts of Southeast Asia, the Green Revolution is losing momentum as farmers find they can no longer look for regular supplies of irrigation water for their multiple crops of bumper-harvest rice each year.

In addition, deforestation leads to

soil erosion, causing sedimentation of water reservoirs and hydropower installations. Reservoirs in the Philippines, Pakistan, Ecuador, and Colombia are now estimated to be losing their capacity within half their projected life spans. Similarly, the Panama Canal is filling up with washed-off soil from eroded watersheds, making it less able to handle outsize cargo ships. In Thailand, waterways that once provided an energy efficient transportation network have become too choked with silt debris to be navigable. Now that additional deforestation-caused troubles, notably disastrous floods, are spreading to broad sectors of Thailand, the government has decided to use extraordinary powers of summary judgement, even execution, to punish unauthorized cutting of forests.

Regrettable as these ecological repercussions are for the tropical countries concerned, they are far from the whole story. From the standpoint of interdependency within the global community, some further, and ultimately more important, issues arise. Were tropical moist forests to be largely eliminated, the process could have a major impact on world climates (see *Reports* Vol. 8 no. 2).

These climatic consequences are scarcely more important than the impending loss of a large portion of the earth's stocks of species. Of the 5–10 million species that are believed to exist on earth, as many as 40–50 percent are thought to live in tropical moist forests. The next few decades could see the elimination of at least one million species in these forests, conceivably many more. It is not unrealistic to suppose that we are losing at least one species per day right now. Aesthetic and ethical arguments aside, there are strong economic factors in favour of safeguarding species.

To consider agriculture first, tropical moist forests have supplied the origins of many staple foods, notably rice, millet, cassava, pigeon pea, mung bean, yam, taro, banana, pineapple and sugarcane, to name but the better known. A huge cornucopia of other foods waits to be investigated. In Indonesia alone, some 4000 plant species are thought to have proved useful to native peoples as food of one sort or another, yet less than one-tenth have come into wide use. At least 1650 plants of tropical forests offer highly nutritious leaves.

Moreover, tropical moist forests contain many wild relatives of modern food crops — crops that, being the refined products of genetic engineering, require constant "topping up" with fresh germ plasm in order to resist new types of diseases and pests, environmental stresses, and the like, as well as to increase productivity and nutritive content. During this century, genetic resources from tropical forests have saved a number of important crops, including bananas, sugarcane, cocoa, and coffee. To give an idea of the economic values involved, groundnuts worldwide have suffered from leaf-spot diseases — a problem that proved surmountable through resistant varieties from wild forms in the rainforests of Amazonia, among other areas. The annual value of eliminating the diseases is estimated, by the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), at US\$500 million.

Forest animals can also assist modern agriculture. Within the forests of the Thailand/Kampuchea (Cambodia) border lives a secretive cow-like creature, the *kouprey*. This creature is believed to have been one of the wild ancestors of the humped zebu cattle of Southern Asia. Fresh crossbreeding between the two bovids could boost cattle raising throughout an entire region. Regrettably,



Photo: Jack Redden

The threat to tropical forests is economic as well as environmental: hardwoods are one of the five most important export commodities of the developing world.

the *kouprey's* survival is doubtful because of military activities within its habitats during the past 15 years, and little prospect exists for secure living space in the foreseeable future.

Tropical moist forests can also help to keep down the numerous pests that reduce the amount of food already grown around the world. Despite an annual pesticide bill of several billion dollars, at least 40 percent of global crops are lost each year to insects and similar pests, both in the fields and in storage. A sound way to control pests is to utilize chemicals from plants that have developed mechanisms to repel insects. The main source of these plants is tropical moist forests. Pest control can also be advanced through selective breeding of adapted species of insects — a method that could prove more effective and economic in the long run, and result in less environmental disruption than widespread application of persistent toxic chemicals.

In addition to providing a hefty boost to agriculture, tropical moist forests are earth's main repository of drug-yielding plants. At least 70 percent of the 3000 species of plants that are known to possess anti-cancer properties exist in the tropics, mainly in tropical moist forests. The huge stock of tropical forest plants still to be investigated could well supply as many more. In addition, recent research suggests that many insects, notably butterflies, offer potential anti-cancer compounds — and tropical moist forests harbour between 1.5 and 3.5 million insect species. It is on these grounds that the National Cancer Institute of the USA believes that the widespread elimination of tropical moist forests could represent a setback to the anti-cancer campaign.

Let us also look briefly at a category of drugs that is of growing importance — those that serve as contraceptives and abortifacients. The rhizomes of a forest zone vine, the Mexican yam (*Dioscorea composita*), yield virtually the world's entire supply of diosgenin, from which a variety of sex hormone combinations are prepared, including the "pill". (Diosgenin is also used to manufacture cortisone and hydrocortisone, used against rheumatoid arthritis, rheumatic fever, sciatica, certain allergies, Addison's disease, and several skin diseases.) By the mid-1970s the world was using up to 180 tons of diosgenin per year: by 1985, the amount could reach 500 tons, and by 1995, 3000 tons. Current sales of Mexican yam materials for contraceptive pills amount to us\$7 million per year, and when chemical compounds have been made up, the figure rises to \$70 million, and across-the-counter sales for final products total \$700 million.

A third category of products is derived from tropical moist forests — specialist materials for industrial use. From South-east Asia's forests alone come latex, gums, camphor, dammar, resins, dyes

A herbalist sells his wares in Bangladesh. Tropical forests are the earth's main repository of drug-yielding plants.



Photo: Neill McKee

and ethereal oils. One group of industrial products is especially important, oils and lubricants. Many forest plants bear oil-rich seeds, such as the Babassu palm (*Orbignya martiana*), the Seje palm (*Jessenia polycarpa*), several species of the *Caryocar* genus, and a number of other trees that grow wild in Amazonia. The Babassu's fruit contain up to 72 percent oil, which can be used to produce fibres, cattlefeed, soap, detergents, starch and general edibles, and can serve as a substitute for diesel oil. Similarly, the "petroleum nut" (*Pittosporum resiniferum*) of the Philippines produces a highly volatile oil, and was used by the Japanese as fuel during World War II.

Many other plants of tropical moist forests could offer utilitarian benefits to man, if their economic potential can be investigated before their forest habitats are eliminated. One hundred years ago, the value of the rubber tree was unknown. What new "rubber tree" now stands in the way of some settlement project in Borneo or a ranching enterprise in Amazonia? Tropical moist forests contain many thousands of local species, any of which could be forever lost in a single month's cutting for a fresh land development project. This is not an unduly pessimistic prognosis. A tree that was once a major source of timber in Ecuador's lowland forests swiftly lost its native habitats to plantations of bananas and oil palms after its wildland home was opened up by a road in 1960. It is now reduced to 12 reproducing individuals in less than one square kilometre of forest at the Rio Palenque Biological Centre — the Centre itself being the last surviving patch of lowland wet forest along the western base of the Andes in central Ecuador.

Another valuable "resource" is likewise headed for oblivion: the large number of forest-dwelling tribes who still pursue their traditional way of life. In 1900 there were 230 tribal groups

living in Brazil's sector of Amazonia, totalling 1 million people. Now there are only 143 groups numbering 50 000 people. On humanitarian grounds alone, forest tribes should be permitted to adapt to the outside world at their own pace. The demise of forest peoples is all the more regrettable in that they represent a fund of experience whose value can hardly be estimated. Amerindians of Amazonia know of 750 plant species with medicinal properties. It was from Amazonian tribesmen who use *curare* — a muscle relaxant — on their arrow tips as a hunting poison that Western surgeons learned of the substance's potential for human operations. Indonesia's National Biological Institute tells of a tribe that utilizes a forest tree as a spermicide, while certain South Pacific islands feature a number of forest plants that are used as first month abortifacients. The World Health Organization (WHO) is searching for safer and more effective materials from which to manufacture an improved "pill", and believes a likely source lies with tribal peoples who have used some 3000 plant species for their antifertility properties.

All in all, it seems a statistical certainty that genetic reservoirs of tropical moist forests contain source materials for many new foods, pesticides, medicines and industrial goods. Provided the wild species in question survive, benefits could accrue to the whole of humanity in perpetuity. In the short run, however, many of the benefits will accrue to developed-world communities far outside tropical forest zones, these being the communities with the technological know-how to exploit genetic resources.

The elimination of tropical moist forests affects not only the developing countries in question. It could precipitate severe if not critical consequences for countries of the temperate zones as well. We either all lose together, or, through sufficient conservation measures, we all gain together.

If current rates of misuse and over-use continue, let alone accelerate, there may be little left of tropical moist forests within another 3–5 decades. This is roughly the time span during which the earth's estimated oil deposits are projected to run out. Thus two critical resources are apparently due to be exploited to exhaustion within the foreseeable future (though one of them is a potentially renewable resource). It is difficult to know which could have the more serious repercussions for humanity's long run welfare. □

Dr Norman Myers, a Consultant in environment and development based in Nairobi, has worked with the Food and Agriculture Organization of the United Nations (FAO), the Rockefeller Foundation, and the USA's National Academy of Sciences. His book, The Sinking Ark, much of it dealing with the problem of disappearing tropical forests, was published in mid-July 1979, by Pergamon Press, New York and Oxford.

Rural women, working women

Eleonora Cebotarev

Women's roles and their relation to development have recently begun to attract the attention of researchers and policymakers alike. Eleonora Cebotarev, one of these researchers and author of Rural women and development, a new approach to home economics in Latin America, participated in a panel on the management practices of women during the symposium on science and development organized by the Centre in Toronto, Canada, last May. On the following pages we present excerpts from her address, and a review of Cebotarev's monograph, published in Spanish by IDRC, by Stella de Feferbaum.

According to the latest estimates there are between 22 and 25 million women 15 years and older in rural Latin America. The lifestyles of these women are almost predetermined: to marry early and to serve one's family, or to leave to become a domestic servant, an industrial worker or a prostitute. The choices are truly narrow.

At present the central task of women who choose the first option is to provide the daily life-supporting services for over 100 million men, children and elderly. Development could not proceed without their work: the nations do not have funds to provide the services that they are rendering, and, if the private sector was to supply them, these families could not afford them. Most of these households have per capita yearly average incomes of around US\$300. Few exceed the US\$500 mark.

The concerns that govern these women's management practices are true strategies for survival: how to help produce and allocate the family's meagre resources so as to assure the greatest measure of well-being for all members, often excluding themselves.

Women's daily lives are not structured by work schedules and clocks, but by survival needs of family members: they must be fed at specific times, scrubbed and cleanly dressed, admonished or encouraged, and hugged before going off to school or work. The home, where more than half the lifetime of these 100 million plus people is spent, must be cleaned, arranged, and made into a livable place.

The satisfaction of survival needs, however modest, is the principle that guides management practices, and the satisfaction of daily needs of food and dress, hygiene and rest, recreation and growth is what sets the rigid daily pattern of women's work. In rural communities women represent the stable, permanent and reliable element in family life — they are always "there" willing to assume a variety of responsibilities to assure the well-being of family members.

Photo: Ron Poling



In rural Latin America there is men's work, neutral work, and women's work. Women's work normally involves cooking, feeding the younger members of the family, and the messy and repetitive aspects of life like changing diapers and cleaning up babies, washing clothes, cleaning the house and kitchen, and washing pots and pans. The neutral work comprises shopping, looking after older children, perhaps ironing a dressy shirt or minding a barbeque. Men's work is for cash, in agriculture, business and other "unprotected" jobs that take place outside of the sheltered environments of home and family, the women's domain.

The remarkable thing in this division of labour is its very "one sidedness". Women are much more willing to ignore social norms and to engage in masculine work when the well-being of the family members is at stake. Women fit a number of neutral and masculine activities — farming, cutting wood, butchering — into their basic work pattern as defined by their nontransferable household tasks. The important point to realize is that they take on this work *in addition* to their other responsibilities.

Men, on the other hand, are much more reluctant to busy themselves with women's work. As our research has shown, men are willing to engage in feminine activities only under crisis situations. Otherwise they avoid it as much as possible. And this is what gives ground to our concerns.

We are not saying that in this population segment men's work is easier, more pleasant or more rewarding than women's work, but it is more specific and more circumscribed. And a great deal of science and technology has been focused on finding ways of making men's work more productive and effective. Men work hard and long hours, but when the work is over they are served their meals and can have a bit of rest. In contrast, women's work is a 24 hour responsibility.

In the international development context there is presently a great emphasis on "integrating women in de-

velopment". Programs are set up and facilities provided that attempt to ease women's participating in the work world of men. When successful, these programs may achieve an increased cash income for the family. However, what they also certainly produce is an additional expansion of the workload of rural women, as their household responsibilities are not taken into consideration.

When we concern ourselves with rural families it might be useful to recognize the differences between rural households as socioeconomic units, and farming as an enterprise. The enterprise attempts to increase its profits, but the household strives to augment its income, be it in cash or kind.

The production of income in kind — the house-produced goods and services for family use — are almost exclusively the province of women. It might be important to recognize that the contribution this "income" makes to the health and well-being of family members might be just as crucial as cash income.

It is this fact that points to the need to direct the attention of science and technology towards making the domestic processes involved in this work more efficient, and to alleviate the drudgery of what is commonly considered the unproductive and unessential work of women.

Women's roles centre around concerns that attempt to ensure a better quality of life and to hold the family together in a broader sense than do those of men. In Latin America, rural women earn respect and increase their power if they achieve these aims in effective ways. By far the most respected position the average rural woman can aspire to is that of wife and mother. Thus she can gain the respect of the community and the love and support of her children. In this position she is free to enter the work world of men — and often is forced to do so. For many rural women in Latin America "liberation" may mean *not* to have to take on this additional work load. □

New economic order for homes

What role do home economics play in rural development and agricultural extension work? How are these programs related to national and regional development objectives? Are the costs of such programs justified? These and other questions were posed by the delegates at an international conference on integrated rural development held in Colombia.

According to Eleonora Cebotarev, who attended this conference, "there was much criticism but few real answers given".

Shortly thereafter, Cebotarev began extensive research on this subject in Latin America. Initially, she found that many countries had eliminated home economics programs, others gave them scant support, and no country really provided any solid backing for this work, although all of them clearly recognized the need. If there was an awareness of the problem, there was little interest in facing it. This lack of interest was not wholly unjustified, as traditional homemaking programs had achieved little. In the past, many of the programs introduced in Latin America were not necessarily conceived as an instrument for change: their efforts were largely focused on transmitting what were often poorly adapted technologies.

In some cases these programs had already been replaced by others aimed at providing specialized activities or services such as health and education to the community. Although these activities and services promoted the integration of the rural sector, they overlooked the family as a productive unit of goods and services essential to the well-being of its members.

This approach was disturbing, for by overlooking the family, it also overlooked the central figure in the family: the woman. This was no surprise, but merely reflected an elitist tradition that viewed household work as women's work. Little attention has been paid to this work because — given the opportunity — women themselves generally delegate it to others who, for economic reasons, have to accept it. The person most affected in this process is the rural woman who has little opportunity to improve home technologies. If she was in some way relieved of her traditional household tasks, it would increase her family's well-being and make it possible for her to participate in other activities.

The whole approach to home economics had to be revised. Eleonora Cebotarev set out to provide a solid conceptual framework for this discipline and to develop an instrument for field work. This would make it possible to determine how present home technologies can be improved or new ones introduced to reduce the amount of time and energy women spend in household work.

It was clear that home economics had to cast off its traditional conservative nature and become a source of social change. In this way it would be linked to the development process that aims at integrating women, raising their position in society, involving them in social and political life, and making it possible for them to fully exercise their rights. To date, home economics have helped women to be better housewives, but nothing more.

The final goal of Eleonora Cebotarev's new approach was to achieve "a satisfactory standard of living". Functional, her approach meshes with overall development objectives. The difference between home economics and development lies perhaps in the fact that the first operates at the base level — the family group or the communities — while general development efforts follow sectoral and specialized lines, at broader regional and national levels.

Eleonora Cebotarev proposed the concept of household management, a process that controls the relations between the family or domestic group and its physical, socioeconomic and cultural environment. This process is made up of a series of activities, practices, decisions, organization and tasks that are carried out when resources are converted into products and services necessary to satisfy family needs and desires. In short, home management is the process of "utilizing what one has to achieve what one wants".

Household management can and must influence this entire series of activities. The amount of time rural women spend on household tasks is rarely taken into account by development programs because, among other factors, this time tends to be evaluated in conventional economic terms which attribute it little importance. However, a group of economists is now trying to evaluate what the discipline of economy has neglected up until now, that is, intrafamily tasks performed for no pay. New Home Economics (NHE), as it is known, takes into account not only household technology and materials, but also the time employed in the production of goods and services which satisfy needs. It examines the way in which the value assigned to human time spent on these types of activities is changed by practice, education, and changes in the use of technologies. It further analyzes how these activities can be turned into remunerative ones.

This new trend has direct implications for home economics because it has instruments to produce the desired changes in the way a housewife uses her time, and to increase the value of this time in terms both of satisfying needs and desires and of achieving economic gains by means of household technologies. By modifying the way time is employed in the home management process, home economics directly facilitates the involvement of the family in other areas.

In addition to designing the conceptual framework for this new approach, it was also necessary to design the appropriate research instrument to collect the quantitative information and evaluate the program. The instrument, which has been tested many times in several Latin American countries with the cooperation of Cebotarev's colleagues, was revised as often as necessary until it achieved its final form. Its

careful design makes it possible to detect problems related to the use of household technologies, to provide information on the way in which rural housewives' time and energy is employed, and to give an overall view of family activity patterns. It also provides the demographic and economic information needed and a scale to measure changes in the family unit.

The emphasis of Cebotarev's work is not to present a rigid conception of home economics or a static methodology, but rather to create an interest and awareness among home economics workers of the advantages of conceptual clarity and of the use of systematic procedures for guiding and strengthening their specific activities. Its main goal is to clarify particularly important aspects of this area of study and work, to propose an explicit conceptual framework, and to present a research methodology that can be used by field workers in planning and evaluating their work.

Its most important contribution is, no doubt, that it points out the importance of household technologies as an instrument to improve goods and services produced in the home, and also as a means of liberating women from such work. The relationship established between household technologies, time and energy savings, and women's traditional roles could turn home economics into a dynamic and positive development factor in Latin America.

However, the success of this strategy will depend, in the long run, on three factors: the rural family's recognition of the possibility of acting on and influencing the solution of problems; their motivation to act; and the adoption of improved processes or household technologies that make more time available for new activities.

Experience indicates that the emphasis on saving time and energy must also be accompanied by guidelines indicating the different ways in which this new free time and energy can be used. Without this guidance, without stimulation, and without an awareness of the new situation, few women show much desire to explore new opportunities. □

Stella de Feferbaum

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Health aides make themselves heard

Michelle Hibler

"I want big, fat, nice babies in my clinic", Mrs L. Levy warns a young mother who has come to the well-baby clinic at the Department of Social and Preventive Medicine, University of the West Indies (UWI), in Kingston, Jamaica. A community health aide, Mrs Levy has been at the clinic for over 10 years. The results of her work show: whereas gastroenteritis and malnutrition are the main health problems in the rest of the country, they are not in the low-income urban area served by the clinic. "They hear me", says Mrs Levy.

Mrs Levy was one of the first CHAs in Jamaica. Pioneered by the Department in 1967, a pilot program trained eight aides to work in the communities neighbouring the university, Hermitage and August Town. Today there are close to 1200 aides throughout the island and the government plans to double the figure in the coming years.

For many years in Jamaica the "practical nurse" served as an auxiliary nurse, but without legal status. When they were officially recognized in 1966, they became "enrolled assistant nurses", entitled, after training, to work in hospitals, doctors' offices and nursing homes. In community medicine, however, no auxiliary personnel existed.

The Department of Social and Preventive Medicine of the university had been working in Hermitage and August Town providing a health service while using the communities as "laboratories" for teaching community medicine. Some of the residents in the area worked as volunteers in the clinic. Impressed by their assistance, Dr Kenneth Standard, Head of the Department, wanted to give the volunteers some training that would help them to function more effectively and with greater confidence. Thus the CHA program was born.

Late in 1967, the Department explored the possibility of recruiting suitable persons from the community to become health aides — a public health equivalent to the hospital auxiliary worker. It was emphasized that the intention was not to train another category of nurse, but rather to prepare persons from within the community to involve others in accepting responsibility for improving standards of health, and at the same time, teach them to carry out basic home procedures. The aim was to give these persons basic training and motivate them to the extent that they would be willing to work with families and to identify problems that would then be brought to the attention of trained health personnel. They would serve as links between the community and the health services and perform basic tasks such as following up on broken appointments, assist in clinics as receptionists and by carrying out routine tests and treatments, advise on nutrition, and visit homes to help care for the sick, elderly and infirm, and young children.

Eleven persons were chosen in the Hermitage-August Town area for selection and orientation. Eight of these — including Mrs Levy — were then retained for a further three months of training, both theoretical and practical, in antenatal care, family planning, human relations, nutrition, human growth and development, basic anatomy and physiology,

first aid, sanitation and hygiene, as well as in the function and structure of government and social agencies.

In 1970 the program extended to the parish of St Elizabeth. Sponsored by UWI, the Ministry of Health and Environmental Control and the Cornell University Medical College, this second experimental program was to serve Elderslie, a remote rural community isolated from health facilities where infant malnutrition was severe. "The idea was growing", says Miss Olive Ennever, coordinator of the pilot program and research assistant at the university.

The program received a boost in 1972 when the government, based on the success of the experiments, adopted the CHA program. The expansion, initially into two parishes in the north of the island, was also designed to provide employment to otherwise unemployed — and unemployable — women, says Miss Ennever. The training course was reduced to eight weeks. Since then, expansion has continued and aides are at work in all parishes.

The aides, although literate, have not generally completed more than the 6th form. The main selection criteria are that the aide live and be active in the community and be interested in the health program. Age and sex are not determining factors, but most are women aged 25 to 45.

The Jamaican activities have had repercussions in another English-speaking island in the Caribbean, Antigua, where the Ministry of Health, with the assistance of UWI, recently trained its first group of 20 CHAs. In view of the continuing Jamaican expansion and the development of new programs in other islands, a critical evaluation of the CHA program was needed to improve, where possible, the aides' performance. Such an evaluation began in 1977 with IDRC support.

Conducted by the Department of Social and Preventive Medicine in collaboration with the Ministries of Health of Jamaica and Antigua, the study aimed to evaluate the training program, the performance of the aides and their supervision. In Jamaica, 200 aides were interviewed and observed at work. Their supervisors and other members of the health team were also interviewed, as was a random sample of residents in the communities where they work.

It was found that, except for a few tasks such as taking blood pressure, laying out service trays, and crowd control, the aides were satisfied with the training they had received. Almost all felt that the public enthusiastically welcomed their services, and job satisfaction was high. The performance of duties observed was satisfactory and corresponded well with their job descriptions.

Their supervisors, although they considered that the two-month training course was too short, felt they were able to function more effectively since the CHAs had joined the health team. The main problems encountered were the large number of aides they were called on to supervise, heavy work loads, and lack of regular contact. Dissatisfaction was also expressed about selection procedures of the aides, and most felt that the aides should have attained higher educational levels.

Similarly in Antigua where 19 aides were interviewed, most listed the distribution of food supplements, family planning, and taking blood pressure as the duties for which they were not adequately trained. Job satisfaction was high here as well. In both islands the public expressed confidence in the aides and felt they were doing useful work in the clinics and health centres, and during home visits.

The results of the evaluation will be used to make specific recommendations for improved training, performance and supervision. "You can say that in Jamaica and Antigua the programs are here to stay", says Mrs Patricia Desai, coordinator of the study, "but they have imperfections and the evaluation will suggest ways of improving these."

If Mrs Levy is typical of the aides at work, they are undoubtedly rendering useful services. A number have even expanded their activity into community action by organizing community group programs in handcrafts, health, and nutrition. This commitment to their community and their understanding of the people and their problems is probably their greatest asset.

"You can't find that in textbooks", says Mrs Levy. □



Photos: Jaime Rojas

In Jamaica, trained people from within the community act as health aides. Top: Public confidence produces more demand for services. Bottom: Mrs Levy in the well-baby clinic, Kingston.

IDRC

New focal point

Ivan L. Head
IDRC President

A new policy designed to increase cooperation between Canadian scientists and their counterparts in the Third World was one of the major announcements made by the Canadian delegation to the United Nations Conference on Science and Technology for Development (UNCSTD) in Vienna last month. The IDRC was named "lead organization and national focal point" for this new program.

In the following article IDRC President Ivan Head explains the background to the announcement and examines the implications for the Centre's future.

Throughout the year of preparatory meetings, and at UNCSTD itself, the nations of the Third World repeatedly called upon the industrialized nations to increase substantially the application of their domestic research and development capacity to the solution of the problems of the developing countries. Canada's proposal is a direct response to this call, and is based on the recommendations of a report prepared by the Ministry of State for Science and Technology (MOSST) following a study of Canadian science and technology capacity and the role it might play in international development.

The MOSST report points out that the Third World accounts for only 2-3 per cent of world expenditures on research and development (R&D), and that the resulting dependency costs the developing nations some \$9000 million annually for patents, licences, and the like. The report also stresses the importance of R&D capability as a key component of a country's technological infrastructure.

Among the recommendations put forward by the Third World countries at UNCSTD, one called for "action on the part of the developed countries to support and facilitate the internal efforts of developing countries to achieve development through the establishment

of endogenous scientific and technological capacities." Another asks that "direct linkages should be established between the research and development systems of developed and developing countries through cooperative arrangements."

In the context of these and similar requests, the MOSST report observes that, in spite of the cultural and climatic differences, there are many areas of "surprising congruence" in the problems facing Canada and the developing countries. Canada's remote northern communities, for example, share common problems such as communication, health care delivery and sanitation with many developing countries. In fact the MOSST report found examples of Canadian research and development of relevance to the problems of developing countries in every sector reviewed.

In recommending an emphasis in policy to encourage actively such cooperation between Canadian and Third World scientists, the report recommends IDRC as a natural focal point for the efforts. "IDRC's program meets the most pressing need and demand of the Third World in a manner which has made it a model for imitators." The Centre should be invited to "provide the necessary initiative, drive and leadership to ensure that programs and participating bodies are welded into a coherent whole", the report suggests.

To support this activity it is recommended that the Centre's annual grant be increased over five years to a total of four percent of Canada's official development assistance budget (it rests at the moment at a little over three percent). A proportion of these additional funds, perhaps as much as \$12 million annually, would be devoted to the application of Canadian R&D resources to international development.

That, very briefly, is what the MOSST report recommends. In fact very little of what the report says is new — many of the same arguments were used when the Centre was first proposed a dozen years ago. Even the action proposed — an increased emphasis on the use of

Canadian R&D capacity and research of "mutual benefit" is already part of IDRC's mandate.

The IDRC Act, passed by Parliament in May 1970, specifically empowers the Centre "to enlist the talents of natural and social scientists and technologists of Canada and other countries" and "to foster cooperation in research on development problems between the developed and developing regions for their mutual benefit". During the Centre's first nine years the concept of research for "mutual benefit" has been given less emphasis than has the task of assisting the developing countries to build their own scientific and technological capabilities. Or as IDRC's first President, David Hopper, expressed it, "creating in developing regions a capacity that will enable them to bring to bear the methods of scientific enquiry to the solution of their own problems." There is no suggestion in the new policy that this activity should cease or be curtailed. The additional funds will permit greater attention to be paid to the cooperative research dimension.

The MOSST report was considered by the Executive Committee of the Board of Governors at its meeting in June, and will undoubtedly be a major topic of discussion at the full meeting of the Board in Ottawa in October. The Governors are responsible for setting the Centre's directions, and it will be their role to determine the appropriate response to this new policy.

A lively discussion at the June meeting reflected the pride shared by the Governors that the Centre had been recognized by departments of the Government of Canada as well qualified to extend its activities. There was at the same time emphasis that any additional funding should be accepted and employed only on the clear understanding that the independence of IDRC not be weakened and that there be no impairment of either the integrity or the credibility of the Centre in the eyes of the developing countries.

The Centre is now approaching the end of its first decade of operation. During those ten years the IDRC has acquired a worldwide reputation for its innovative approach to international development problems, yet has remained relatively unknown in Canada, even among the country's scientific and technical community. This new proposal will likely extend within Canada an awareness of the Centre, and in so doing enhance its ability to encourage even greater Canadian support for international development.

The task of absorbing this new program and discharging it effectively will not be easy. I have no doubt, however, that the Centre is well qualified to do so. The high scientific standards of IDRC personnel will continue to be applied as the Centre is given these additional resources to discharge in all its dimensions its 1970 mandate. □

Keeping pace with city growth

Very early in the history of the IDRC a decision was made to concentrate research support largely in the rural areas of developing countries. Seventy-five percent of the people of the Third World live outside the cities; most of them are subsistence farmers and their families; most live in small villages lacking even the basic amenities such as schools, health care, water supply, and sanitation. The decision to apply the major thrust of the Centre's research support to improve the lives of these people was not a difficult one. But this decision did not mean that the cities would be entirely ignored. Rather the Centre has supported urban research projects where they relate to the complex interaction between city and countryside.

Many of the cities of the Third World are growing faster than their ability to provide services. And as more and more people move in from the countryside in search of a better life, the problem is compounded — for the city depends to a large extent on its rural hinterland. A better balance between urban and rural living has to be found. Thus the Centre has funded studies of rural-urban migration patterns to find out why people move from the countryside to the city, and what happens to them when they do. Many are unable to find homes, and end up in mushrooming squatter settlements. So the Centre also supports research to improve living conditions here, and other studies aimed at providing sites and services, better low-cost housing, food and transportation systems, and employment opportunities. Some of these projects and their implications are examined in the following pages: □

Bob Stanley

Botswana's self-help community

Jeff Endrst

Developing Botswana is pioneering a new approach to the traditional ills of urban squatter settlements. Based on self-interest and self-help, the experiment may provide badly needed answers to problems posed by millions of rural migrants flocking to crowded Third World urban centres. The anticipated results will mean dignity and self-respect for the squatters.

The Naledi Squatter Upgrading Project in Gaborone, the capital of Botswana, recognizes the potential of existing squatter settlements to serve as viable communities when provided with an adequate framework for services.

Naledi, which means "Open Sky", may be unique in that its 10 000 inhabitants represent close to one quarter of Gaborone's population, but are living only on one tenth of the capital's area. Its origins are peculiar to the transition of the country from British Protectorate to independent nation in 1966. Gaborone, lying on the old Rhodesian railroad and close to the South African border, was chosen as the country's new capital. From 600 inhabitants then, it now has more than 30 000, and continues to be one of Africa's fastest growing urban centres.

The lure of a growing city where political power and money are concentrated has been the major reason why people from the surrounding areas flock to Gaborone. Drought, a thirst for education, or the search for seasonal work has compounded the problem.

The people squatted in what was to have been a temporary labour camp located between the Rhodesian railroad line and the Lobatse highway, south of Gaborone. The Naledi camp was located on land that the government had zoned for industrial development.

The camp was devoid of most urban services. This did not bother the squatters so much as it did the health-oriented city fathers of Gaborone. The squatters had no sociological or anthropological understanding of the toilet, for example. Instead of going to the fringes of their former village, they now relieved themselves along the highway or the railroad track. The merciless sun performed nature's cleanup through evaporation. For the Naledi dwellers no social or cultural problem existed, but the hygiene-conscious government knew better.

In 1973, Botswana devised a large resettlement scheme which was to provide low-income housing across the road for the Naledi squatters. Their old makeshift dwellings were to be bulldozed. This scheme failed, however, because of a lack of funds needed to accommodate such a large number of displaced people.

In 1975, the Government changed its mind. It dropped the industrial zone designation of Naledi. The settlement was no longer "illegal": it became a residential extension of Gaborone. As a consequence, it was necessary to upgrade the quality of life of the Naledi residents, a task

that was entrusted to the Ministry of Local Government and Lands.

With the cooperation of the Canadian International Development Agency (CIDA), the government began laying plans for turning 116 hectares of squatter land into a development area where 2000 individual plots would house 10 000 people. That also meant providing roads, water, street lighting, pedestrian malls, two primary schools, a health clinic and a community centre.

Today, Naledi is well on its way to becoming a suburban housing development experiment that combines the needs of the people with the traditional Tswana culture.

Throughout Naledi, groups of plots are separated by an extensive network of lanes and paths. Some plots are well defined by hedges, trees or fences. There are several substantial homes of fancy designs. There are many traditional Tswana homes built of mud bricks with thatched roofs. More and more, however, people prefer the contemporary rectangular structure of two or three rooms built of concrete blocks with a corrugated iron roof. To own a home like that has become a status symbol for most Naledi residents.

The government makes certain that Naledi residents earn their right to be there. They do not become legal residents until they obtain a Certificate of Rights that allows them to occupy their plot for 99 years. The Certificate is issued on condition that the owner constructs a "sound house" within 12 months, and that he or she will pay a monthly levy to defray the cost of road maintenance, water supply, refuse pickup, etc. This is done by the Self-Help Housing Agency attached to the Gaborone City Council that also provides loans for building materials, payable within 15 years.

When a deal is signed and sealed, a Naledi plot owner discovers that the first installment on his future dream house is the foundation for his toilet — a cement-covered pit three metres deep. The future tenant is encouraged to start building the toilet first because it is one of the preconditions of the whole deal. Eventually, it becomes an outhouse which, in Naledi, rates as another status symbol.

The government, after extensive research supported by IDRC to find a suitable alternative to the pit privy (see sidebar), has settled for the Reed's Odorless Earth Closet (ROEC) toilet manufactured in South Africa: 150 of them have already been made available. They come with a tall chimney-like tube painted black that is designed to make the outhouse fly-free and odourless.

Most of the residents build their own house. Some of them become so adept that they turn construction workers and stay in the business.

One of the first things a Naledi house-owner is likely to do is to have the new structure blessed by a minister of one of some 40 African churches represented in the settlement. This costs a predetermined fee, and is said to make it more difficult for one of the half-dozen witch doctors living in the community to put a spell on the house.



Squatter settlement in Naledi, Botswana. The basic latrine is provided, the rest is self-help housing.

Churches in Naledi did not have to be planned. They came and grew to meet the cultural and spiritual needs of the squatters-turned-city-dwellers. On Sundays, they compete for the faithful by trying to drown out the competition with loud music. After services, social parties follow. Women are in charge of rounding up potential partygoers. There are African-style barbeques, lots of loud music, and lots of homemade beer called *chibuku*. Made of sorghum, and tasting like spiked porridge, it is viewed by men as highly nourishing — and by their wives as very intoxicating.

According to Jon van Nostrand, CIDA project manager, there is remarkably little violence or discord among the Naledi residents. He attributes it to their deep-rooted cultural background which has not yet been significantly eroded by urban pressures.

The Naledi residents represent all of Botswana's tribal backgrounds. The community is still in the formative stages of political organization. There is no single headman. Some elders may be called upon to mediate a family quarrel or a dispute between neighbours about the boundaries of their plots, but there is no "police" in Naledi as such.

Naledi's squatters are not all by any means destitute. The pattern of their settlement in this "village" is closely related to that of the traditional villages from which they come. The village-lands-cattlepost relationship in the lives of these people has established a framework for the daily, monthly and yearly cycles of activity, both for their tribes and for them individually.

As a result, says van Nostrand, the majority of Naledi residents continue to view their houses as second or third homes. They are attached to Gaborone by industrial and commercial employment and higher incomes, but their primary home remains in their native village where they often return for weekends.

Others come to live in Naledi only during periods when they are not required on the cattleposts. Most of their income made in or around Naledi is invested in refurbishing their home village houses or for enlarging their herds. "Some people living in Naledi have a hundred head of cattle on the family farm somewhere else," says van Nostrand.

The Botswana government likes to promote this strong relationship between the agricultural and industrial/commercial sectors. In addition, Naledi has become an important source of labour and self-generated production. Relatively few of the residents are unemployed, and about a quarter are self-employed, selling food, making beer, producing bricks, pottery, furniture, tinwares, clothes, and providing services such as laundry, although most residents are well enough off to prefer drycleaning. Some of them build larger houses to be in a position to sublet a room with a separate entrance.

The apparent success of the Naledi experiment — scheduled for completion in mid-1980 — lies in the fact that the inhabitants of this settlement are essentially responsible for their own social upgrading. The government of Botswana, with CIDA's assistance, has made available the technical tools, money and organization for the project to succeed. Some of the residents are now involved in Naledi community projects such as the construction of local roads and primary and adult education courses. A monthly newsletter keeps the residents abreast of important community news.

Naledi, which started as a squatter settlement, is now a socially and economically involved community. □

The "best fit" for Naledi

Rowan Shirkie

In searching for a sanitation technology for the Naledi settlement project, researchers from the Ministry of Local Government and Lands had to come up with a system that used little water, was simple to operate and maintain, hygienic, acceptable to the people for whom it was intended — and at low cost.

Attempts to introduce a previously unproven design of water (aqua) privy had failed, creating a certain hostility on the part of the public. The IDRC-supported team, for their part, took special care to determine attitudes towards latrines and study common practices. Of the different approaches tested, including double vault composting toilets, pit privies, and an improved version of the unsuccessful aqua privy, the preferred system was the Reed Odourless Earth Closet (ROEC). The ROEC is basically a pit latrine with a vent pipe. The pit is offset from the superstructure, connected by a sloping chute. The vent pipe encourages air circulation that dehydrates fecal matter — a process well-adapted to areas with extended periods of low relative humidity such as Botswana. A concrete floor, close-fitting seat cover, and flyproof gauze capping the vent pipe keep unwanted odours and insects out.

Although the "best fit" in high density, low-cost situations such as Naledi, and ROEC is not perfect. The nature of the underlying soil and water are such that a buildup of polluted waste water from seepage may in time present a health problem. Providing a watertight lining in the pits could overcome this potential hazard. Careful placement of the ROECs with respect to water table levels is another solution. The hazards must be weighed against the costs.

Toilets are not the ultimate in sanitation, of course. Providing the facilities without also motivating people to use and maintain them properly will only lead to frustration and a waste of precious and limited resources. □

Jeff Endrst, a freelance writer and UN correspondent, recently visited a number of southern African countries.

Asian cities at the crossroads

Yue-man Yeung



Photo: Neill McKee

On the periphery in Jakarta, Indonesia: 80 percent of residents are outside the reach of basic urban services.

Southeast Asia is not only characterized by an overall low level of urbanization, but also by a high degree of primacy — the largest or primate cities are many times the size of the next largest in rank. The increase in urban population has been outstripping the growth of the population as a whole. It is estimated that the urban population of Southeast Asia will double in slightly over 14 years, and according to one projection, its urban population of 60 million in 1970 will triple by the year 2000. Whereas one in five persons in the region lived in cities in 1970, one-third of the population will live there by the end of the century.

Within the urban sector the saliency of the primate cities is readily apparent, and although the rate of population increase in some of these cities has slowed down in the decade 1960-1970, the growth rates of most capital cities are still too rapid for the comfort of planners and administrators.

It is the urban environment of these primate cities that poses the greatest challenge to city administrations: providing enough jobs, decent housing, basic infrastructure, free-flowing traffic, and ideally, the machinery to transmit positive growth-generating impulses down the urban hierarchy and to the countryside. The urban environment has been visibly deteriorating, in some cases to such an extent that an urban crisis is at hand.

Many metropolitan governments in Southeast Asia are faced with an urban challenge of unprecedented proportions. Urbanization in the region, as in many parts of the developing world, has been racing ahead of industrialization and economic growth. Yet, an urban transformation cannot be said to have occurred. The economic structure in many countries is little modified from the traditional in which the highest proportion of the labour force is engaged in agriculture. Despite limited progress in grain output associated with the Green Revolution, the remarkable upsurge in agricultural productivity that accompanied the urban transformation of the developed countries is nowhere in sight. In the cities, there has been only a limited reorientation of the urban economy toward manufacturing industries. The combined result of the lack of basic changes in the economy is the persistence of relatively low annual per capita gross national products. As a consequence, urban functions are increasingly involuted, and dualistic economies, symptomatic of underdevelopment at large, are prevalent. Unemployment and underemployment are becoming major developmental and social problems confronting city governments.

Yet urban growth and urbanization continue to gain pace through considerable rural-urban migration and natural increase. The population dynamics of the region may be termed a combina-

tion of pre-industrial fertility and post-industrial mortality. Cityward migration has also been triggered by war-related factors. In a different context, under the Second Malaysia plan, *bumiputras* (indigenous peoples) have been encouraged to move into cities.

A consequence of government-induced rural-urban migration is the challenge posed, in varying degrees, to city governments in mediating among ethnic, religious and cultural differences inherited from a pattern of colonial development. In both the precolonial and colonial city, ethnic segregation was practiced so that people of the same ethnic group but of varying socioeconomic backgrounds tended to live in close proximity. Under the impact of modernization and urbanization, residential location and occupational specialization with ethnic affiliation has been weakened. Social class, denoted by income, wealth and occupation has gradually become a new criterion for residential separation. If this is so, it is clear that profound changes are taking place in the spatial organization and urban ecology of Southeast Asian cities. City governments will have to alert themselves to potential conflict based on class lines.

As a heightened sense of social justice is developed amongst the proletariat and the urban poor, the question of growth and equity has to be faced. The prevailing trend in many of the large cities is an ever-widening chasm between the urban rich and the urban poor. Additionally, the wide relationship between city and countryside has to be reviewed critically since growing urban-rural imbalance may lead to the demise of the cities themselves.

The challenge faced by many urban governments is how to keep the city economically vibrant, physically functional, and growing in an orderly manner. Viewed against the general background of a plural society, persistent dualism, widespread poverty, a teeming population, a labour explosion, a sluggish economic transition and miniscule budgets, the challenge is indeed enormous. With the exception of Singapore, almost every national and metropolitan government has to devise means and incentives to hold the farmers on the land so that any incremental urban improvement has a chance to be felt, and a balanced national development strategy can be maintained.

It is the design of indigenous solutions to the urban problems that ultimately hold the key to success. Within the past ten years, at least five distinct approaches have been tried with varying degrees of success. In Jakarta, for example, where 80 percent of the residents are outside the reach of basic services, the governor declared the city "closed" to jobless settlers in 1970. Evidence of employment and housing must be shown before a residence permit is obtained, and the cost of the return

fare to their point of origin must be deposited for six months. The results have been mixed: some suggest that in-migration has not slowed down, and others that the high price attached to the residence card has contributed to bribery and corruption.

Manila's approach has been to create a Commission grouping the metropolitan area's 28 separate administrative districts — the first time city services and resources have been integrated. Bangkok is pursuing plans to decentralize, locating industries and accommodation beyond the city. Universities are also relocating to peri-urban areas, and satellite communities are being planned. Policies to encourage regional growth and reduce rural migration to Bangkok are largely fragmented, however, and show only limited results.

Malaysia's cities face different problems because of the imbalance between the *bumiputras* and the immigrant groups. Of the total urban population in 1970, Malays made up about one-quarter and their share of property ownership was disproportionately lower than their share of the population. In the aftermath of the 1969 racial conflict, the Second Malaysia Plan set out to reduce poverty by raising income levels and increasing employment opportunities for all Malaysians. It also aimed to restructure society by reducing and eventually eliminating identification of ethnic groups with economic activities.

Singapore as a city state has taken some bold and innovative measures. Two recent policies adopted in Singapore have potential application to other countries. These are the introduction of a battery of economic disincentives aimed at attaining zero population growth, and the use of a multiplicity of tax and fiscal measures in an effort to curb private automobile ownership.

Despite these measures, most of the primate cities in Southeast Asia will become gargantuan agglomerations of 10 million or more inhabitants by the end of the century. If the beginnings of a workable solution are not soon found, the prospects for the cities cannot be but grim. To meet the problem squarely, the cities need to be designed for the poor rather than follow the prevailing mode, adopted from the industrialized countries, of fitting the poor into cities basically designed for the moderately wealthy and the rich. Urban Southeast Asia is at the crossroads. One road leads to relative hope, the other to despair. It is vital that the right decisions are made at this time. □

Yue-man Yeung is Senior Program Officer in the Social Sciences Division, based in Singapore. This article is adapted from a paper entitled "The urban environment in Southeast Asia — challenge and opportunity", published by the University of Hong Kong in Geography and the environment in Southeast Asia, 1978.

Paving the way for low-cost transportation

Rowan Shirkie

Urban transportation and urban growth go hand in hand. And while only about one-quarter of the developing world population is urban, typically nearly half the national output is produced in towns and cities.

Transportation in cities and towns is essential in maintaining the necessary concentrations of workforce and production units. Transport facilities expand employment opportunities, and give access to health, education, and other social services that are often only available in urban areas where the numbers of people make them more economical.

These are the basic essential purposes of urban transportation. But in fact, people make the most use of urban transport — and spend more money on personal travel — for additional comfort, convenience, and time saved over and above the "bare necessities" of transport.

In developing countries, public transport cannot cope with the growing demands. The level of service and area of coverage is inadequate, and a large portion of the travelling public is too poor to afford any but the least costly means of movement.

Enter the *becak*, jeepney, *samlor*, *silor*, and *dolmus*. These are the thousands of small-engine or muscle-powered vehicles that zip, buzz, and glide through busy streets in Asia. In most cases they are the ingenious adaptations of existing types of transport. The Indonesian *becak* is a muscle-powered tricycle that can carry two passengers, the jeepney, a remodelled (and usually brightly



Photo: Neill McKee

A samlor pedicab in Thailand. Is there a place for such low cost transportation in growing cities?

decorated) jeep that can carry eight to twelve. In Thailand, three-wheeled *samlor* or four-wheeled *silor* ply the streets with two to four people on board. In Turkey a vintage automobile — the 1956 Studebaker is a great favourite — will carry passengers along a regular route. For the right price, the Turkish *dolmus* will become a taxi delivering a fare to any destination.

These vehicles provide a relatively cheap and flexible means of mobility for low-income urban dwellers. They are also a significant source of employment, particularly for poor or unskilled migrants to the city, and represent an indigenous and potentially capital-saving solution to meeting transport needs.

Unfortunately, the *becak* and its cousins have a bumpy road ahead. Although the levels of private automobile ownership are low, traffic congestion in developing country cities in Asia is severe. These low-cost transport (LCT) modes, without a doubt, have contributed to "traffic anarchy".

The vehicles are often on the road continuously, driven by up to three shifts of drivers. Their frequent breakdowns, and in the case of muscle-powered vehicles, slow speed, worsen congestion. Terrific competition for fares often leads drivers to ignore or violate traffic regulations — overloading, or stopping suddenly, anywhere, any time, to take on or discharge passengers.

The conflicts between personal and mass public or commercial transport have presented municipal authorities with tremendous traffic and administrative headaches. This led, in the case of some Indonesian and Thai cities, to a ban of LCTs on city thoroughfares or in limiting them to certain areas. Such moves often brought protests from the city residents who rely on this transportation network.

IDRC funded a study of low-cost transport systems in Indonesia, the Philippines, Thailand, and Turkey aimed at providing a better understanding of how these low-cost vehicles fit into the total urban transportation system, and at aiding authorities in managing and planning facilities to meet the growing demands of the travelling public.

It was recognized that the desire to get rid of low-cost transport vehicles sprang more from an imported ideal of what a modern urban transport system should look like than from a clear understanding of the role LCTs played in travel patterns. The study set out to gather and analyze information about how LCTs operate, who the operators and drivers were, the people they served, fares charged, investments made in them, and what service they provided.

Preliminary findings of the study have brought some interesting facts to light. LCTs account for a significant portion of public transport in the cities studied: ranging from 12–15 percent in Bandung and Yogyakarta, to 40–50 percent in Manila and Istanbul.

In Indonesia (Bandung and Yogyakarta) the *becak* — the most traditional of the LCTs studied, one of the two non-motorized modes — is suffering from competition both from other traditional types of mass transport (walking and bicycling) and modern modes. A lag between increased flows of motorized traffic and the necessary road improvements has further squeezed the *becaks* out of circulation — they continue to cause tie-ups.

Jakarta has embarked on a policy of completely phasing out the *becak* as the city grows and its transportation needs become more sophisticated, and as the resources to service those needs become available.

However, in Bandung and other centres, the *becak* as a spontaneous response to transport needs still has considerable assets in lower fares, door-to-door service, ability to serve small neighbourhoods as well as major thoroughfares, and in the movement of goods and people between rural and urban areas. Because of its simple technology and economy of operation, the *becak* has generated so much employment that its prohibition would cause serious social dislocations.

In Thailand (Chiang Mai) the *becak* has its counterpart in

the *samlor* pedicab. It too, is losing out to the motorized competition, mainly in the form of a converted pickup truck, the *silor*. The *silor* has continued to gain popularity due to its reasonable fare, flexible routes and ability to transport goods as well as passengers. But municipal ordinances, which do not recognize the *silor* as a safe or legitimate form of public utility vehicle, cut into the function this LCT might assume in supplementing bus service.

The jeepney in Metropolitan Manila in the Philippines has encountered and produced similar problems. Urban growth and motorization have far outstripped road and traffic improvements, and the everpresent jeepney has come to symbolize "ruinous competition" in traffic behaviour and transport management. But it also provides a demand-responsive and flexible service that buses cannot replace, and employment for some 34 000 drivers, as well as indirect income benefits for many others in repair and shipping businesses, etc.

Buoyed by local mass assembly and custom built vehicles with larger capacities, as well as wide publicity as a tourist curiosity, the jeepney seems to be securing a place for itself in the transportation system. Planners are now more inclined to speak of improving and integrating bus and jeepney transport than of phasing out jeepneys altogether. Considerations of quality of service, traffic management, road development, and urban physical form are paramount, however, and transport modes such as the jeepney must adapt to changing urban circumstances.

The *dolmus* and minibus in Turkey (Istanbul) seems to face many of the basic problems affecting the other LCT modes. New domestic and European cars are joining the ranks of vintage American rolling stock, but services and benefits do not seem to be enhanced. Noting its "visibility as a problem" the Turkish part of the study reports that the *dolmus* is perceived as figuring large in traffic jams, licence plate controversies, and strikes. The characteristic flexibility of service of LCTs seems to have taken a turn towards exploitation, with the *dolmus* switching operations from a sort of multiple-user bus to a taxi mode during peak hours — and doubling fares. Public sentiment (or resentment) has turned to mass rail transit, but the *dolmus* may have saving graces in its economy of operation, employment opportunities, and area of service.

Although the final conclusions have not yet been made, the studies seem to draw out a common thread.

The wide range of needs and incomes between "transport consumers" presents a need for a correspondingly wide spectrum of transport services. There is room between the pedestrian and the rapid transit rail line for low-cost alternatives. In providing needed intermediate services, *becaks*, jeepneys, and other LCTs also present an opportunity for small private entrepreneurs to make a contribution to urban transport and urban economies. Unfortunately, this potential is often limited by regulations or physical planning that is designed to protect bus systems or private automobiles from competition.

With the burgeoning cities goes a shortage of resources, rapidly increasing demand for transport, and rising road and facilities costs that threaten to produce more congestion and costlier urban transportation. Mass transit, such as metros and other forms requiring their own right-of-way, because of their high capital and associated costs, offer only partial solutions for the future. Higher transport costs will contribute to higher costs of production and a deterioration of the physical and social environment and standard of living.

The poor must move. And as they continue to flow into the cities of developing countries, the cities themselves must change. Urban transport and urban form are closely related ... the pattern of one greatly influences the development of the other. Cities are changing in developing countries, and if they are to continue to accommodate the poor as well as the rich, then transportation planning must also reflect these realities. □

Housing: rural roots to urban problems

Susana Amaya



Photo: Jaime Rojas

Urban housing shortages and crowding slums spring from a lack of opportunities in rural areas.

Although frequently at odds and often engaged in mutual recriminations about their problems, the city and the countryside are inseparable. Urban housing problems, for example, cannot be explained without looking at the living and working conditions in rural areas.

An analysis of housing and urban underdevelopment in Colombia, carried out by a group of researchers with financial support from IDRC and under the coordination of the Interamerican Planning Society (SIAP), clearly shows the connection between urban problems and the countryside. Housing problems are explained as the result of the free market form of development that prevails in most Latin American countries.

One must, in fact, go quite a distance away from today's overcrowded, ill-equipped, slum-ridden cities to discover, in agriculture and farming, the origins of the housing problem. In the 20th Century, as industrialization occurred in the cities, the pattern of large colonial land holdings slowed down the modernization of agriculture and placed it in secondary position to industry.

In 1948, Colombian agriculture began to respond to the demands of industry, particularly for raw materials needed in textiles, food and beverages manufacturing. (In 1950, these products accounted for 76 percent of the aggregate industrial value.) This sector of agriculture became modernized and mechanized.

Agricultural production for direct consumption developed more slowly, however, resulting in low capital investments in this sector as compared to the high investments in industry. Small farmers were thus forced to migrate in increasing numbers to the city in search of work.

In the cities, the process of industrial development could not absorb the large supply of unskilled labour arriving from the rural areas. A large labour pool was formed, with the effect of keeping industrial wages low. This low wage situation was reinforced by industry's adoption of capital-intensive, labour-saving technologies that limited job opportunities.

How does the urban housing situation reflect this process? Because of the concentration of population in the cities, the housing demand is large. High rents and costly land prices produce progressive crowding and a housing shortage. Many families, unable to find adequate housing at a price they can afford, are forced to improvise their own shelter in outlying urban areas, using any available scrap as building materials. As these slums, devoid of services, are formed in the peripheral city area, downtown areas also undergo deterioration and crowding. In 1972 in Bogota, for instance, 59 percent of the total population of almost three million

lived in squatter neighbourhoods.

The construction industry further aggravates the housing problem. In Latin America this industry was slowly transformed from an artisanal phase when building was done manually, using rudimentary tools, to today's modern industry. With the modern phase came monopolistic prices that are beyond the means of low wage earners. Very limited capital and credit opportunities are available. But while the price of housing has risen sharply, people's real incomes have not.

Certain urban development or urban renewal initiatives have contributed to the housing problem. The Integral Project for the Urban Development of the Eastern Sector of Bogota, for example, had to be abandoned because of the serious consequences it would have had: thousands of low-income families living in the area would have been uprooted.

This situation was quite common in Europe during the Industrial Revolution. Friedrich Engels, socialist philosopher and industrial theorist, noted in the mid 1800s that when large masses of rural workers were suddenly attracted to the growing industrial centers, the arrangement of buildings in the cities no longer responded to the needs of industry and traffic. Old streets had to be widened and new ones built. New transportation and urban development projects were begun "exactly at the same time when workers were flowing into the cities; this was precisely when the massive demolition of workers' housing occurred."

The housing shortage is both an absolute shortage and one that mainly affects the low-income residents — independent workers, small merchants and craftsmen. It is estimated that the shortage affects as much as 75 percent of the economically active population in the main cities of Colombia, and 66 percent in Bogota. As the researchers point out, the shortage will disappear only over the very long term when ideal conditions of full employment exist as a result of greater productivity, thereby creating higher income levels and reducing the relative cost of construction. □

The study focusing on housing in Colombia was one of a number carried out in seven Latin American countries under an IDRC-supported Low-Cost Housing project. The findings of national studies, now all completed, have been published by the countries concerned. SIAP is completing the publication of a three-volume synthesis covering comparative studies, government policies, and land and urban reforms in Colombia, Costa Rica, Guatemala, Mexico, El Salvador, Paraguay, and Venezuela. (SIAP, Apartado Aéreo 21573, Bogotá, Colombia.) This article is adapted from Colombia: Vivienda y subdesarrollo urbano (Housing and urban underdevelopment), published in July.

Confidants of small industry

Jean-Marc Fleury

In Surabaya, Indonesia, the Sumber Logam foundry was wasting ten percent of its copper to oxidation, which occurred while the product was transferred from one oven to another about fifteen metres away.

On the east coast of Malaysia, in the State of Trengganu, the owner of a small cane furniture business watched helplessly as a large portion of his stock rotted away next to his shop.

In Singapore, employees of a small plastics factory had to do the same job twice in order to cut a plastic strip into 40-cm pieces as it came out of the extruder; first sawing it by hand into sections of four to six metres long, then cutting it into smaller pieces with an electric saw.

In these three cases and in thousands of other similar ones, problems such as these are now things of the past. A new family of experts in Southeast Asia, industrial extension officers, have brought to such small and medium industries the information required to improve their profitability. The foundry owner, for instance, simply moved his two ovens closer together, thus cutting his losses by 80 percent; the cane furniture maker now protects his stock from humidity by boiling the canes in a tank of oil; and a movable electric saw attached to the extruder enables the plastics producer to use his labourers more efficiently.

If these things were possible, it is because all the problems, in spite of their diversity, had something in common: they could be solved by applying basic knowledge, without recourse to any research, patents, or exclusive information whatsoever. While a great deal of effort and money is being invested in discussing a "just and equitable" transfer of advanced technology from industrialized countries, hundreds of industrial extension officers in Southeast Asia daily provide proof that the efficiency of the 450 000 small and medium industries in the area can be rapidly increased merely by drawing upon basic information.

Of course, large businesses have

needs that are more difficult to meet because they require research and access to more technical information. But these companies generally have the means to solve their own problems — or so, at least, the directors of the industrial extension network, TECHNOnet, have chosen to believe. The goal of its industrial extension officers is to link the many small Asian businesses to the body of technical information already in the public domain.

Located in Singapore, the headquarters of TECHNOnet — a major project funded by the Information Sciences Division of IDRC — is essentially a tool for facilitating cooperation and the exchange of information among eleven industrial extension organizations in nine countries: Bangladesh, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Hong Kong, Korea, and Sri Lanka. Participating organizations contact the manufacturers directly. The TECHNOnet Centre, for its part, facilitates the exchange of information and, under an agreement with the Technical Information Service of the National Research Council of Canada (which



Small industries in Southeast Asia benefit by information delivered "on the shop floor."

itself has been in existence for almost thirty years) offers access to relevant technical information originating elsewhere. In addition, TECHNOnet places special emphasis on training.

Consequently, between 1974 and 1977, TECHNOnet trained a core of approximately a hundred industrial extension officers, who subsequently undertook the training of other experts. At the start of this year, the area could count on the services of 1200 of these "confidants of small and medium industries", a figure comparable to that in a number of industrialized countries. These expert troubleshooters for small-scale industry have formed a professional association and their very young profession, introduced into Asia only a few years ago, has already been officially recognized by regional governments.

In real terms, industrial extension means that rather than depend solely on experimentation, the small manufacturer in Southeast Asia can count on someone who is ready to come and explain to him, in his own language, how to overcome the problems which beset him. Moreover, the TECHNOnet network enables the industrial extension officer to make available not only the experience he acquires from visiting his own country's industries, but also that acquired by industrial extension officers in the eight other participating countries. Because, generally speaking, only basic knowledge is involved, the industrial extension officer can make the experience acquired in each industry visited available to all.

In practice the success of the organizations in the TECHNOnet network — more than 15 000 visits made and 10 000 inquiries answered yearly — is due primarily to the confidence inspired by the industrial extension officers. As they know how to win the esteem of businessmen, they can establish strong personal relationships with them, and communication by word-of-mouth is still the most effective means of transmitting information.

More recently, TECHNOnet has emphasized the importance it attaches to human resources by undertaking to train young businessmen. It has access to outstanding training facilities for this purpose, because certain businessmen, having benefited from the network's services, readily allow TECHNOnet instructors to use their installations. Seminars and reviews such as the *Entrepreneur's handbook*, which will be published this year, are offered as complements to the network's activities, with a view toward training a new generation of manufacturers even more open to new techniques.

Solidly established, and possessing considerable experience, the TECHNOnet network is a unique tool for implementing the policies of industrial decentralization and the promotion of small and medium industries that are being put forward by many governments. □

Information develops an international outlook

Jean-Marc Fleury

If a Princeton University student can build an atomic bomb using information already in the public domain, it surely means that a lot of information is freely available."

By remarking on this actual (and newsmaking) event in his opening speech at the conference on "Documentation, Information and International Development", organized by ASTED, the Association for the Advancement of Documentary Sciences and Techniques, in Ottawa last June 20-21, Prof. Louis Sabourin, Chairman of the Development Centre of the Organization for Economic Co-operation and Development (OECD), sought to show how the obstacles hindering free access to information are more often bureaucratic than anything else.

According to Mr Sabourin, it is now generally held that 80 percent of all information is both available and accessible. In view of this, he invited documentalists to fight bureaucratic attitudes and put information to work.

"Information must serve the decision-makers, and the first to benefit from this will be those offering such services, for they will find themselves increasingly important," he said in reply to a young documentalist from Singapore, who expressed concern that libraries and information are last in governmental priorities.

The speaker affirmed that he is basically optimistic about the development of information services and libraries. Governments have abandoned their earlier attitude of indifference for one of control. Thus, the developing countries are less and less willing to accept the unequal North-South flow of information: shown in their insistence to win acceptance for the famous declaration on the fundamental principles of information agencies, which denounces the monopoly exercised by the four main Western press agencies. He also cited the last UN Conference on Trade and Development (UNCTADV) in Manila, the failure of which he attributed in large part to the fact that the Third World countries took three weeks to assimilate the documentation. Moreover, the difficulties encountered in Manila convinced several representatives from developing countries to establish an "OECD" for the Third World in order to formulate a common position. All this, Mr Sabourin felt, proves that an



Photo: Jack Redden

Information systems can be good servants to development.

information deficit directly affects the negotiating process.

Mr Sabourin went on to say that with an annual world production of 600 000 books and millions of scientific articles, it had been necessary to create a new science — information science.

"Until now," he said, "its greatest accomplishments have been in the exact sciences." He mentioned as examples the large international information networks such as INIS, the International Nuclear Information Service; AGRIS, the FAO agricultural service; and UNISIS, a UNESCO service for the coordination and free circulation of scientific and technical information.

Much remains to be done, however, particularly in the social sciences and the humanities, in which "approaches, methodologies and terminologies differ according to the localities and subjects involved, and are not as rigorously defined, established and recognized as they are in the exact sciences." For example, development-oriented national and international organizations alone annually publish more than 100 000 reports, of which probably only 40 percent are available commercially. In order to standardize classification and information systems and increase the circulation of these documents, the OECD Development Centre has published a common lexicon, the *Macrothesaurus*, which has brought some discipline to the processing of information about development. Over the longer term, the DEVSIS (International Information System

for the Development Sciences) project coordinated by IDRC is expected to establish the first international information bank on development.

Mr Sabourin's advice to the Canadian documentalists present, who expressed a desire to take a more active part in development, was that they were entirely right in wishing to become involved in these matters, because "development is not something that belongs only to the Third World." He suggested that they establish very concrete and practical programs in collaboration with individual countries or institutions, and urged them not to overlook small-scale projects, such as those in the field of children's literature, which he said is as important for the children in the Third World as for those in industrialized countries. Organizations of documentalists in developed countries could also play a useful role in welcoming trainees from developing countries. Finally, the training of Canadian documentalists and librarians could be more internationally oriented.

Another speaker, Mr John Woolston, Director of Information Sciences at IDRC, described several of his division's projects. He pointed out that in general, by financing research projects on information sciences in developing countries, IDRC has helped to increase the importance of their libraries and information services. "We have helped give librarians a new status, because now they can say to administrators: 'We, too, can obtain funds from foreign organizations.' Unfortunately," added Mr Woolston, "we are alone; and other aid organizations do not allocate funds for information."

Finally, the symposium closed with a communication by Mr Réal Bosa from the Bibliothèque Nationale du Québec (Quebec national library), who encouraged Canadian documentalists to continue their involvement in international organizations such as the International Federation of Library Associations and to organize more study sessions under international cooperation agreements.

Judging by the quality and quantity of the participants in the ASTED conference, it is clear that Canadian documentalists hope to cooperate actively with their Third World colleagues. Besides, are they not members of a profession that can only be practised on a global scale...? □

Rattan

tremendous scope for use and research

Michael Graham

Rattans, climbing palms that grow throughout Southeast Asia (and turn up as furniture and baskets all over the world), are such an important component of rural life in the region that some people rate them as the most important forest product after timber. In spite of this, however, and the fact that the international trade in rattans has grown into a multimillion dollar business, rattans have often been regarded as minor forest products, and have, until recently, received but passing attention from researchers.

During the past five years a surge of interest in rattans and rattan products has brought about a healthy trend toward organized research into some of the more important aspects of rattan culture and use. This interest has proven both fortunate and timely. The disappearance of large tracts of more easily accessible forest, uncontrolled rattan collection, improper handling and treatment leading to deterioration and waste, and increasing product demand have combined to threaten to destroy this industry.

By sponsoring a regional workshop that brought together government and university researchers and trade representatives in Singapore in early June to discuss rattan research priorities in Asia, IDRC hoped to enhance the ability of this industry to contribute to the socio-economic development of the region's rural areas. Labour-intensive, requiring comparatively low levels of capital investment, and based in rural areas, the rattan industry has many characteristics that suit it to making such a contribution.

Rattans, palms of the sub-family *Lepidocaryoidae*, display a tremendous diversity of growth forms. Stem diameters range from 3 mm to over 20 cm, and vary in length from a few metres to over 200. All species share some characteristics, however. Two of the most important, because they are a major hindrance to rattan collection, are the characteristic spiny leaf sheaths and the climbing organs that allow the plants to attach themselves to the trees that both support them and allow them to reach the

sunlight in the forest canopy. These long whip-like organs with attached reflexed thorns make rattan collection very unpleasant work. Not only are they a constant source of irritation, but because they anchor the rattan so firmly in the trees, it requires much hard pulling — often by three or four men — to dislodge the canes. Compounding these difficulties is the constant possibility of pulling down dead branches, wasps nests and other debris.

Although collection methods may vary slightly from place to place, the cane is generally cut 30–200 cm above the ground and then pulled from the tree. Any part that cannot be freed is normally cut off and left. Soon after the rattan is pulled down, it is cut into pieces of varying lengths depending on the species, the size of the rattan, its intended use, the specifications of the buyer, or to suit the convenience of the collectors.

After the canes have been transported to a central depot, the leaf sheaths adhering to the cane and the hard, shiny silicified epidermis are removed. In Indonesia this deglazing, which must be carried out within 24 hours of harvest, is called *runti*. The simplest but most time-consuming method involves twisting the cane by hand and rubbing it with fine sand, steel wool, coconut fibre or sack cloth. After *runti* the canes are dried for about a week to prevent or reduce blemishes (fungal staining), and to prevent deterioration. The cane is then transported to the exporter who sorts the rattan and rejects the cane of unacceptable quality — usually 30–40 percent.

Further processing involves steeping the canes in a mixture of diesel oil and coconut or palm oil. This step is thought to rid the canes of unwanted gums and resins as well as moisture. There is great diversity in this treatment with mixtures varying in concentration from 50:50 to 90:10 diesel to other oil, temperatures from lukewarm to 130 °C, and periods of immersion from 5–10, to 30–40 minutes. The rattan is then sundried for 7–12 days.

The last step taken by the exporters to preserve the canes is to wash them in a hypochlorite solution and fumigate them with sulfur dioxide. The rattan is then safe from deterioration for many years, and ready for processing into baskets, mats, furniture and other products.

During the workshop, grave concern was expressed by the representatives from Indonesia, Malaysia, the Philippines, Thailand, India and Sri Lanka — all producing countries — that, without management, the constant exploitation of this important resource might lead to the collapse of the industry. In fact, processors — often located in non-producing countries like Hong Kong and Singapore — are already experiencing difficulty in obtaining adequate supplies of large



cane species because of the decrease in readily accessible cane in the forests and export controls placed on the raw material by countries such as Malaysia and the Philippines.

The lack of research on rattans in the past, coupled with the fact that recent efforts are at best only 5 years old, point to the tremendous scope for systematic research on almost every aspect, from the resource itself to the final utilization. The need for research is heightened by the potential benefit the industry can bring to rural people, particularly as the popularity of the finished product has boomed.

The participants, anxious to avoid possible collapse in the industry, gave highest priority to areas of research that would be of immediate relevance. Three broad areas requiring attention were identified: the conservation of existing stocks; the intensification and standardization of research; and extension and training.

Urgent attention should be given, it was felt, to the complete reappraisal of the legislation governing the exploitation of rattans. To date, rattans have not been included in forest management plans, and until they are, chances of conserving existing stocks are minimal. With the rapid disappearance of forests throughout the region, rattans — especially those of economic importance — are a severely threatened plant group. Serious consideration must therefore be given to their strict protection in nature reserves, and the establishment of gene pools in arboreta and botanical gardens. At the same time, rational control of exports of raw rattan would help to control exploitation while promoting local rattan industries.

Immediate gains can accrue to these local industries with the introduction of



Photos: John Dransfield

Simple improved processing techniques for rattan can reduce presently high deterioration losses.

standardized grades and specifications for rattans, and the dissemination of existing information on better methods of processing practiced in other countries in the region. The introduction of improved processing techniques and the training of rattan workers will not only benefit rural communities, but will have a positive effect on the trade as a whole. Examples of local improvements include transportation methods that avoid bending the canes and their subsequent downgrading, and the refinement of cleaning and scraping techniques.

In considering research priorities, the participants felt that it was impor-

tant for results to be comparable throughout the region. This will necessitate standardizing research procedures. Two main areas requiring investigation were identified: silvicultural aspects of both large diameter rattans, especially those greater than 25 mm, and of small diameter rattans, particularly the most commonly used *Calamus caesius* and *C. trachycoleus*; and their utilization.

The difficulty in obtaining large diameter rattans places high priority on several areas of research. There is a need for an extensive regional survey, involving the collection of botanical specimens and samples for commercial testing, as well as ecological and ethnobotanical data. A complete reassessment of the qualities and potential of large diameter rattans, as determined by commercial testing of cane samples, is also required. This testing should include not only those species presently used, but others of similar diameter. Using the information gained in the national survey and from the results of the commercial testing, it should be possible to identify those large diameter rattans with the most potential. Silvicultural trials could then follow and the most promising species be used to establish pilot plantations. Consideration should also be given to the inclusion of rattans in agroforestry systems.

Where species with silvicultural potential have already been identified such as "rotan manau" (*C. manau*) and "palasan" (*C. maximus*), research can be carried out immediately. It is very important, however, that the presence of an already promising species not preclude the survey work which could lead to the identification of others with greater potential.

While the regional survey for large diameter rattans is carried out, little additional effort would be required to obtain specimens and data on small diameter rattans of the less-used species. This is particularly important in areas where the climate is more seasonal than in those areas where the commonly used *C. caesius* grows.

Small diameter rattans are still relatively plentiful, thus there was a different emphasis in the research priorities drawn up by the participants. High priority areas included a socioeconomic and management study of the existing smallholder rattan plantations in the Barito Selatan area of Central Kalimantan, Indonesia, as a basis for the immediate establishment of plantations of these species elsewhere. Two related areas were the analysis of the growth of these rattan species in order to be able to predict their levels of production, and the establishment of reliable seed sources.

Areas that were felt to warrant medium priority include research into basic biology. Studies are required to determine where and when seeds can be collected for trials and the possible establishment of plantations. Closely



Labour-intensive and rural, the rattan industry seems well-suited to developing countries.

related are investigations of treatment and storage, transportation, and the quarantine of seeds so as to improve the supply and facilitate seed exchange within the region. At the same time, silvicultural investigations of transplanting and spacing techniques, survival and growth, soil, moisture and light requirements, and protection from pests and disease, among other topics, are required for successful plantation establishment.

Although small diameter rattans are not considered to be in short supply, some thought should be given to ensuring long-term availability. For example, although *C. trachycoleus* grows only in a small area of Borneo, there is much to suggest that it could grow in all areas where *C. caesius* occurs. Outside the very humid areas of Southeast Asia, it will probably be necessary to find other small diameter rattan species with silvicultural potential and similar cane characteristics, but silvicultural practices already developed could well be applicable to all species.

Priorities in rattan utilization were also established. High priority was given to the improvement of handling methods to reduce wastage and the effort involved in collection, and to the investigation of the scientific basis for current processing techniques so that they may be better understood, and perhaps improved and standardized.

The extension to rural communities of improved methods of harvesting and processing were also felt to be important. This would have the dual effect of increasing the economic benefits to the primary producers in the rural areas while improving the quality of the cane.

Rated as medium priority were relating anatomical and mechanical properties to the improvement of seasoning and treatment methods and to the use of rattan so that the large number of presently unused species can be investigated and possibly brought into use. Utilization research can only be successfully carried out in close cooperation with the rattan trade, however, as product improvement is normally beyond the scope of research institutes. Close cooperation could lead to mutual benefits. Anatomical studies, for example, could provide excellent projects for short-term research by the universities in the region. Clearly, there are areas of overlap in any practical research scheme.

In general, emphasis on increasing personal contact and the exchange of information will lead to a better understanding of regional problems, and ultimately aid in the development of this important rural-based industry. □

Michael Graham, Technical Editor with IDRC's Communications Division, attended the rattan workshop, Rattan Research Priorities in Asia, held 4-6 June in Singapore. The proceedings will be published by the Centre later this Fall.

BRIEFS

A TRULY GREEN REVOLUTION?

The recent discovery of several previously unknown chlorophylls — the green pigment in plants that is involved in the photosynthetic process could have some very interesting applications for food production in the future.

Scientists have heretofore assumed that there were only two chemically distinct types of chlorophyll. Now researchers at the University of Illinois have discovered that there may be a number of different types.

Photosynthesis involves the collection of light energy at several points in green plants and transferring that energy to specific chlorophyll centres. There, special chlorophylls remove electrons from water. The energy in these electrons is eventually converted into chemical energy and food.

In a report published in the journal *Biochemical and Biophysical Research Communications*, researchers suggest that when the structure and function of chlorophylls is understood, it may lead to the development of manufactured membranes that could be more efficient than plants in converting solar energy, water, and carbon dioxide into food.

CLOUDS OVER AMERICA'S SUNBELT

Internal migration is not only a concern of developing countries. The "sunning of America" — the migration of people within the USA to south and southwest regions with milder climates — may produce a major shift in the country's economic and social structure.

If current trends continue, predicts demographer Jeanne C. Biggar in a report issued by the Washington-based Population Reference Bureau, the population of the 15 "sunbelt" states will nearly double by the year 2000, to become 43 percent of the nation's total. With birth rates down in all regions,

migration has become the key factor in a dramatic change of population distribution patterns of the USA.

The shift is based largely on the flow of young, poorer, but better educated job-seekers, and the elderly seeking suitable retirement locations.

Jobs are the primary attraction for migrants. The new technological industries such as aerospace, defense and electronics have located in the region as a result of low-cost land and energy, proliferating transportation links, and a ready supply of trained workers that continues to grow.

Climate is a draw to the region, permitting lower living costs and providing recreational opportunities. Well-endowed with open space, small towns and cities, and retirement centres located well away from "bustling cities", the sunbelt states are receiving the "refugees" of the congested metropolitan areas of the north.

The future is not *entirely* sunny, however. The sunbelt is encountering development problems familiar the world over: rapid growth placing greater strains on resources and support structures, traffic jams, pollution, over-taxed water and sanitation systems, soaring housing prices, and urban sprawl.

CHINA MOVES TO ONE-CHILD FAMILIES

One of the great demographic events in human history has been taking place in China during this past decade, reports Dr R.T. Ravenholt, Director of the Office of Population of the USA's Agency for International Development (AID). China has succeeded in cutting its birth and growth rates by half, and is moving toward the one-child family standard.

In 1978, 11 of China's 29 provinces totalling 46 percent of its population had growth rates of less than one percent. As death rates in the country are about six per thousand, this indicates birth rates of less than 16 per thousand in those provinces. In Sichuan Province, for example, China's most populous province with 89 million people, the birth rate in 1977 was 14 per thousand.

China's planned birth success is due to the delay of marriage and reproduction until at least an adult's mid-twenties, full availability of all birth control methods, and intense education and peer pressure. Births are in fact planned by neighbourhoods or production teams for 5-year periods in accordance to set quotas.

The interval between births in a family is currently about four years, and third births are becoming a rarity in the country, says Dr Ravenholt in a report based on a recent trip to China. Furthermore, with the lengthening interval between the first and a possible second birth, many couples forego a second child.

Nevertheless, with the current age structure and age-timing of first births, even if China limits its reproduction to one child per family, its population will continue to increase. To achieve zero population growth during this century at current death rates, it will be necessary to further delay the timing of first births.

MILK AID : HANDLE WITH CARE

Food aid to developing countries has been controversial in recent years, raising questions about the relationship between humanitarianism, "surplus disposal", and self-reliant development. In the case of skim milk powder, there have also been accusations that it contributes to declining breastfeeding in the Third World and poses health problems due to allergies and contaminated water used in mixing.

Canada's CIDA/NGO milk powder aid program accounts for about one percent of total Canadian food aid. Under this program, the Canadian International Development Agency (CIDA) funds the purchase of milk powder by non-governmental organization (NGO) aid agencies, to a total of Cdn\$20 million.

Because a number of agencies were concerned about the effectiveness of the program, they agreed to co-sponsor an evaluation. Carried out by an independent research organization, the North-South Institute, the evaluation studied the programs of the nine agencies involved, both through documentation and field visits to five countries.

The report of the evaluation concludes that the program is not an agent in promoting bottle feeding and plays a significant role in combatting malnutrition among recipient children. Because it is geared at the neediest and provided as a supplement, it does

not affect local production of foodstuffs.

A number of problem areas are identified in the report, however, including internal distribution channels and control. The areas for action recommended include longer term planning and supply commitments, better reporting and a clearer definition of goals. Practical issues involve packaging, labelling, vitamin fortification, scheduling and communications.

The report entitled *Handle with care: skim milk aid to developing countries*, is available from the North-South Institute, 185 Rideau Street, Ottawa, Canada K1N 5X8.

MALNUTRITION KNOWS NO GENERATION GAP

There is a growing body of evidence that suggests that the effects of malnutrition may reach across generations, and that adequate diet alone will not counteract long-term effects on learning abilities and mental development.

In a study conducted on a colony of rats that had been malnourished for 20 generations, researchers at the Department of Nutrition and Food Science at the Massachusetts Institute of Technology (MIT) in the USA, found that even after three generations of good nutrition, rat pups with a history of malnutrition failed to perform normally on learning and other tests of adaptive ability. Most previous studies of malnutrition have only examined the short-term effects of nutritional deprivation; in general, demonstrating that short periods of deprivation do not produce any long-term effects.

But in human experience, the long-term effects of generations of malnutrition are more important. People in developing regions of the world are not nutritionally deprived for a month, or a year, or even ten years, but have a history of malnutrition lasting many generations.

Dr Janina R. Galler, a professor of psychiatry involved in the study points out that until recently, the generational effects of malnutrition "could not be addressed in human populations because severely malnourished people died. Now with more advanced public health measures and medical techniques we are able to keep many of these people alive. The relevant question at this time is: How can we help them have a better life?"

Part of the answer may lie in providing an enriched living environment along with improved diet. *IDRC Reports* (Vol. 8, no. 1)

recently examined two such "mental supplementation programs" in Colombia, where educational and psychological stimulation was integrated into traditional nutritional rehabilitation programs.

"Food is a first step. It is the most important step, but for populations with a whole range of deprivations — economic and social, as well as nutritional — good food is not enough."

The question of whether human potential is a product of "nature or nature" — genetically determined, or a result of environment — is perhaps misdirected according to Dr Galler and others. Poverty, nutrition, disease, and poor education interact with one another. If the problems do not exist in isolation from each other, then neither should the proposed solutions.

FARM RADIO NETWORK VIA CANADA

It may seem somewhat unusual that packages of information about simple, proven agricultural techniques in use in developing countries, being broadcast in developing countries, come via Canada. But that is indeed the case, thanks to an innovative service offered by Massey Ferguson Limited, through George Atkins, an experienced farm broadcaster.

Concerned about the food crisis in the early 1970s, Mr Atkins, Senior Agriculture Commentator of the Canadian Broadcasting Corporation, proposed a service whereby useful methods of increasing food supplies would be gathered and then made available to farm broadcasters in the Third World. Massey Ferguson turned Mr Atkins' idea into reality.

By mail and through personal visits, Mr Atkins established "The developing countries' farm radio network" of 200 broadcasters in more than 50 countries who periodically receive tape cassettes or reel-to-reel tapes on which are recorded nine items dealing with topics ranging from how to build a pit silo to marketing farm products. Scripts accompany the tapes so that the information can be translated if necessary, or adapted as needed.

Thus, broadcasters have access to information from all parts of the world on effective, proven technologies. "Those who make use of the service seem to appreciate the fact that, while it comes to them with outside help, it is they who have full control of the information and its presentation for the benefit of the people they serve", says Mr Atkins.

BACTERIA BREWS ALCOHOL FUEL

A bacteria that causes problems to the brewing industry may hold a key to fuel shortages. The bacteria *Zymomonas mobilis* can in fact make alcohol by the fermentation of sugar two or three times faster than the conventional method using yeast.

Scientists at the University of New South Wales in Australia believe that the alcohol or ethanol thus produced could have considerable economic significance if used as a gasoline extender. At least one country — Brazil — has already embarked on a large-scale program to do just that.

The bacteria, which gives beer and cider an unpleasant flavour, gives more alcohol than yeast, at a higher rate, and uses smaller equipment. For instance, it could convert crops into ethanol in 1 1/2 hours instead of the 4 hours required with the yeast method. The researchers have also devised ways of recycling the *Zymomonas* to establish high concentrations and improve production figures, and are working on genetic methods of making improved strains.

PESTS NO MATCH FOR COMPUTER

Low-cost, potent, safe insecticides that are effective against a great number of insect species and repel others may seem too good to be true. Yet, with the help of a computer, they have been developed by scientists from the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO).

Known as insecticidal esters, the 18 new compounds have been shown in tests to be among the most potent insecticides known to science, yet massive doses do not seem to have any effect on mammals. Effective against most common pests, from houseflies and mosquitoes to weevils, they also exhibit a strong repellent action against some other pests. In addition, they are biodegradable and would be cheaper to produce than synthetic pyrethroids, while being safer.

Two companies — one in Australia and one in Japan — will carry out further research to select the best compounds for commercial production. Because of the complexity of testing to meet safety and effectiveness requirements, however, it may be some time before they are available commercially.

Photos: Neill McKee



Pods of protein

Bob Stanley



Food legumes have been called “the poor man’s meat”, and for good reason. Eaten together with the right quantity of cereal, they are an excellent source of protein.

Yet, perhaps because they are the poor man’s crop, not a valuable cash crop, food legumes have attracted little attention from researchers — until recently. IDRC, however, has long recognized the potential of many of the traditional farmer’s crops, and has encouraged and supported research programs aimed at improving them.

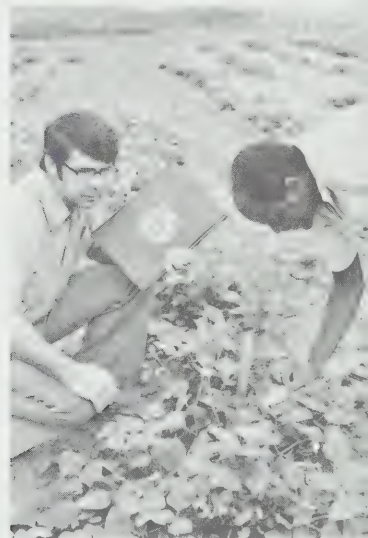
Pods of Protein is a film about one such program — the International Cowpea Improvement Program based at the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria.

Cowpeas are widely grown in the savanna regions of Africa. Their ability to withstand drought and provide their own fertilizer by extracting nitrogen from the air, combined with their high protein content, makes them a uniquely important crop in regions such as the Sahel. Cowpeas are generally found throughout the semi-arid regions of the world — even in the USA, for example, where they are known as black-eyed peas.

This 21-minute colour film illustrates how the cowpea research program is going about its task of improving both the quantity and the quality of cowpea yields. The researchers cover every aspect of cowpea production, from selective plant breeding to surveys on how the versatile legume is cooked and eaten in the home. By encouraging cowpea production they hope to improve the protein intake of people in some of the world’s poorest regions.

The film should be of special interest to educational and research institutes and those involved in crop improvement programs. It is also available in French, and a Spanish version is in production.

For information on loans and purchases, contact the Audiovisual Unit, Communications Division, IDRC, Box 8500, Ottawa, Canada K1G 3H9.



Steering a wise course for agricultural research

Omond Solandt



Dr Omond M. Solandt is widely recognized as an outstanding scientist and manager. He has held a number of senior positions in Canada, including Chancellor of the University of Toronto and Chairman of the Science Council of Canada.

He has been actively involved in a number of international research organizations, including two agricultural research centres supported by the Consultative Group for International Agricultural Research (CGIAR). One of these centres is the International Centre for Agricultural Research in Dry Areas (ICARDA), which has its headquarters in Beirut and serves primarily the Near East and North Africa. Another CGIAR-supported centre is the International Maize and Wheat Improvement Centre (CIMMYT) with its headquarters in Mexico. Dr Solandt is Vice-Chairman of the ICARDA Board of Trustees and a Member of the Executive Committee of the CIMMYT Board.

The CGIAR was founded in 1971 under the cosponsorship of the FAO, UNDP, and World Bank to increase food production in the developing world through research programs and through the training of research scientists and production specialists in developing countries. The CGIAR is assisted by a Technical Advisory Committee (TAC) which consists of 13 eminent scientists.

Thirty-five countries, international agencies and foundations now support the work of 12 international research centres and programs through the CGIAR. The financial requirements of these centres have grown rapidly and the US\$15 million provided for five centres in 1972 has increased to an estimated \$111 million for the 12 activities supported by the group in 1979. These centres and programs now employ more than 300 principal scientists and more than 4000 persons in total.

The growth of the individual centres, with the largest centre having a budget of \$16.5 million in 1979, and the total financial requirements of these activities has led to some concern about the ability or willingness of donor agencies to finance further growth, and about the ability of the centres themselves to efficiently manage expanding research and training programs.

Dr Solandt, writing in his personal capacity, provides a cogent and forceful response to these concerns in the following article.



Thoughtful people who are concerned with the problems of giving aid to the less developed countries (LDCs) are not sure that they know enough about the development process to plan with confidence the most efficient and effective means of attacking even limited aspects of development, much less the entire complex process as it affects a nation. Even within the limited field of agriculture, or the even more restricted task of improving the crops of the poorest farmers, the problems are so complex that they have so far defied complete analysis.

Donors, whether nations or institutions, who seek to

help the LCDs are caught between the Scylla of extended analysis with no action on one side, and a Charybdis of precipitate and ill-considered action on the other side. On the one hand are agencies where the bureaucracy concerned with surveys, analysis, seminars and memoranda far outnumber the workers in the field. When such a bureaucracy does take action it is often too little and too late, and may already have been overtaken by events. It is a process that should be called "paralysis by analysis". At the other extreme are a few relatively small agencies where decisions are made quickly and effectively by a small group of highly experienced people.

To agencies beset with the task of steering a safe course between Scylla and Charybdis, the advent of the Consultative Group on International Agricultural Research (CGIAR), and the expansion of the International Agricultural Research Centres (IARCS) must have provided a very welcome outlet for a very small part of their funds that are allocated to the support of agricultural research. Here at last is a group of international centres guided by a tiny, very expert and experienced team in the form of the Technical Advisory Committee (TAC) and the CGIAR Secretariat. Each of the centres has a distinguished international board of trustees to guarantee the integrity of the operation, and each is managed by an internationally known scientist and staffed by reputable experts. No one seems excessively concerned to ensure that each centre is doing only the very best possible work in its field. Everyone is concerned only to ensure that the money received is wisely spent on research that will have a relatively quick payoff in improving the lot of the poor farmer somewhere. The entire system is action-oriented, motivated by an almost missionary zeal, and it is truly international in both conception and execution. To the beleaguered bureaucrat trying to do a good job of investing money in aid to developing countries, the CGIAR system must appear as a safe and sensible place.

If this interpretation of the system is even partially correct, then the problem of the growth of the IARCS should not be viewed primarily in financial terms. If the IARCS can continue to expand while delivering first class, cost-effective, research results that can — through national agricultural systems — produce quick returns, then they should go on expanding. The TAC should not make the growth of expenditure its first concern, but rather the maintenance of quality and effectiveness. It appears that the TAC has two crucial roles to play in the system: the first is to consider new initiatives for the IARCS in both scientific and geopolitical terms in order to ensure that they meet the high standards of the system; the second is to continually monitor the performance of the centres as it is now doing.

If the TAC is successful in performing these very difficult functions quickly and effectively, and if the boards of trustees of the individual centres do their job equally well, then the growth of the centres will be limited not by the availability of money, but by the availability of projects and people that meet the high standards of the group. If the system is continually effective in rejecting marginal or doubtful projects then its reputation with donors will be maintained and the money that is required will be forthcoming. I believe that the most serious potential threat to this system is not that it should run out of money because of over expansion, but rather that overexpansion should lead to a decline in the quality of both programs and people.

An example of the threat that hangs over the system is the possibility of overexpansion of the regional programs. It is obvious to everyone that the centres must not substitute themselves for national programs of agricultural extension and training. They must ensure that the inputs of knowledge to these programs are good, relevant, and up-to-date, but they must not begin to do the national job themselves. If they do, donors will cease to increase support because the centres will have moved into an area

in which their superiority is not obvious, and both scientific and political criticism is more likely to be heard.

If the TAC, the CGIAR Secretariat, the Boards of Trustees, the Directors-General and the international scientists in the system all keep before them a vision of a small, high quality, nonbureaucratic, action-oriented system that focuses its attention on areas in which science is likely to improve the lot of the poor farmers of the world, then the activities of the group will not be limited by the availability of funds: they will be limited by the scarcity of good people, and in many directions by lack of new and promising ideas.

Based on a limited knowledge of a small sample of the IARCS — including CIMMYT, one of the oldest and largest — I do not believe that any of the centres are approaching the upper limit of a manageable size. If they are viewed as conventional research organizations, then most of them are more likely to suffer from being so small that they do not contain the critical mass of expert knowledge required for good interdisciplinary research. The phenomenon that is causing some people to feel that the individual centres are approaching the "upper limit" is one that is often seen more clearly in business. A man starts a small business and it grows successfully. Suddenly he begins to experience a wide variety of problems in every branch of the business. He either has to avoid further expansion or deliberately expand so that he can afford to have good people under him to run the larger venture as a team. I sense that some of the IARCS are at this upper limit of size for monolithic management. More effort must be made to find, and to retain in the system, financial and personnel managers who are in their own fields the equal of the best international scientists. When this is done there is every reason to expect that even the largest of the present centres could double in size without any serious problems in management and control.

Having suggested that there are probably no financial or management reasons to restrict the growth of the IARCS in the foreseeable future, I want to emphasize that I do not favour rapid or hastily planned expansion. Great care must be taken by the Boards of Trustees to discourage empire building and growth for growth's sake. Staff and facilities must be added only to undertake well thought-out programs that fall within the area of specialization of the particular centre and can obviously be better done by that centre than any other. There is much to be said for keeping individual research teams as small as possible. A few first rate scientists with adequate technical help can do wonders.

The possibility of operating the CGIAR system successfully in this way depends primarily on each centre having a strong and effective Board of Trustees that accepts full responsibility for helping the Director-General to select a good program and manage it effectively. Donor confidence and support can only be maintained and expanded if the donors have confidence in the ability of the Boards to select and support good Director-Generals who, in turn, will select and support first class research and management teams.

The quality of the work in the individual centres attracts donor interest, but it is the skilled guidance of the CGIAR Secretariat and the TAC that keeps the team of widely different centres pulling together effectively.

And finally there is the TAC, which I see as the scientific watchdog and conscience of the system. As long as the quality of the Boards, the Centre Directors and the international staff remain adequately high, the TAC does not need any authority to control the programs of the centres: it can continue to act, as it has in the past, through its influence both on centres and on donors. A centre has now and should continue to have the right to determine its own program. There will obviously be very few cases in which a donor would be willing to ignore the advice of the TAC and fund a program which the TAC had refused to support, however. The wisdom and experience of the members of the TAC is the final guarantee of the scientific integrity of the system as a whole. □

New publications

Beyond Manila, Philippine rural problems in perspective, Gelia T. Castillo. Published in September 1979, 420 pages, IDRC-116e.

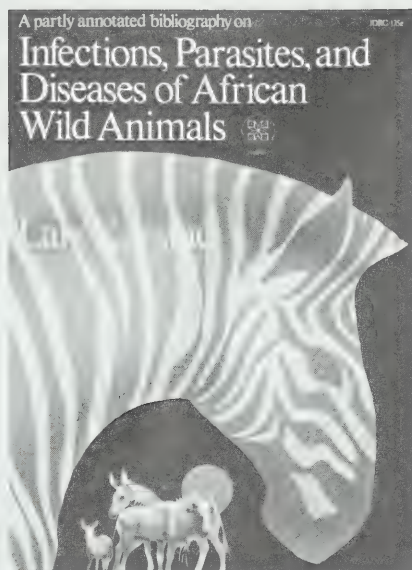
Described by the author as a "modest response to a very appropriate challenge", that of examining and interpreting social science in the Philippines, this monograph aims to present a research-based picture of Philippine rural problems with a rural-urban perspective and a regional dimension. Produced with the assistance of an IDRC Research Fellowship, it outlines patterns of poverty, inequality, and employment in rural areas, family structures, education, technology transfer and internal migration, among other problems. A member of IDRC's Board of Governors, Gelia Castillo argues for the primacy of rural development in planning and thinking, a genuine "rural mindedness".

World of literacy: policy, research and action, International Council for Adult Education. Published in August 1979, 128 pages, IDRC-117e.

Aimed at active practitioners in education and related fields, this review of literacy research documents, covers to some extent, the state of national commitment to literacy work in a number of countries. It provides an overview of planning, organization, curriculum and costs of literacy programs, and sets out guidelines for those who make decisions about educational policies. An extensive bibliography is included.

Pathogenicity of trypanosomes, George Losos and Amy Chouinard, editors. Published in August 1979, 216 pages, IDRC-132e.

Focused on African trypanosomes that are pathogenic to cattle, these proceedings of a workshop held in Nairobi, Kenya, in November 1978, contain some 35 papers dealing with the organisms, infections, mechanisms of cellular injury, blood and tissue responses, and lesions. Also included are the welcoming addresses, summaries of discussions, a list of participants, and references.



A partly annotated bibliography on infections, parasites, and diseases of African wild animals, Lars Karstad. Published in August 1979, 111 pages, IDRC-135e.

Produced as a working tool by the staff of the Wildlife Diseases Section, Veterinary Research Laboratories, Kabete, Kenya, this bibliography centres on the transmission of diseases between wild and domestic animals. References on normal anatomy, physiology and behaviour, as well as wildlife capture and management are also included.

Diseases of fish cultured for food in Southeast Asia, Brian Davy and Michael Graham, editors. Published in August 1979, 32 pages, IDRC-139e.

This report is based on a regional meeting, held late in 1978, that brought together fish disease specialists from seven Southeast Asian countries in Bogor, Indonesia. Rather than reproduce the papers presented, the publication summarizes the concepts behind the workshop and the attempts that are being made to develop an ongoing series of linked research efforts. It covers the national and regional status of fish diseases, biological aspects of parasites, regulations in the traffic of live fish, training and research, and recommends priority areas for future work.

Atlas of hystero-graphic studies of the "IUD-holding uterus": mode of action and evaluation of side effects of intra-uterine contraception, I. Kamal. Published in September 1979, 118 pages, IDRC-127e.

This atlas shows the relationship between the size and shape of intrauterine devices (Lippes loop and Copper-T) and the uterine cavity in over 100 plates taken through hystero-graphy, a special X-ray technique. The result of 14 years of research, the monograph illustrates the "harmonious fit" relationship, as well as incompatible fits, and advances new findings that may explain certain side effects, complications, and possible failures.

Science and technology for development: planning in the STPI countries, Francisco R. Sagasti and Alberto Aráoz, editors. Published in August 1979, 178 pages, IDRC-133e.

The third in a series of publications arising from the Science and Technology Policy Instruments project (STPI), this monograph differs from the preceding ones in that it is a collection of papers prepared for a meeting in s&t planning. The reports present an overview of the main issues involved in s&t planning, the implications of economic development plans, outlines of planning experiences in the countries participating in the project, and descriptions of methods or more general considerations in s&t planning. A reflection of the present state of the field, it should stimulate discussion of how countries' investments in s&t can be planned to ensure the greatest benefit to development.

Science and technology for development: technology policy and industrialization in the People's Republic of China, Genevieve C. Dean. Published in July 1979, 108 pages, IDRC-130e.

This study, commissioned by the STPI project coordinators to provide new insights to the innovation process, examines institutions in the PRC that have been used as instruments of technology policy for industry. It begins with a review of China's first Five-Year Plan, and argues that economic and technological objectives in Chinese development policies have remained largely the same since 1950, and that policy adjustments and changes in institutions during the following decades have been imposed by conditions beyond the planners' control.

La médecine traditionnelle au Zaïre, revised and abridged by Rashim Ahluwalia and Bernard Méchin. Published in August 1979, 63 pages, IDRC-137f.

This monograph, which summarizes a technical report on an IDRC-supported project, mirrors the double orientation given the research: a true picture of traditional medicine and a description of the actual situation on the one hand, and suggestions for the reorientation of health policies dealing with healers on the other. It contains concrete data on healers and their patients, looks at their treatments as a medical system, and describes the evolution of traditional medicine in Zaïre. It recommends that "modern" and traditional medical systems be integrated in a new health system that would be truly African. (English edition to be published late September.)

For information on these and other IDRC publications, see announcement on the back cover of this issue.

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RURAL BASICS

Cover photo: Bob Stanley. Rural areas in the Third World, like this farming village near Alexandria, Egypt, remain the focus of much concern. Development here must begin with the basics — the crops that are the people's livelihood. Beginning on page 10, this issue takes a special look at how some crops are managed for development.



The IDRC Reports, and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division.

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Contents

3 The poor create tomorrow's cities

The needs of the poor are mother to a new invention — cities built and run by the poor themselves, reports Jean-Marc Fleury.

6 China retrieves a tradition of information services

Kieran Broadbent gives an account of libraries and information services in the People's Republic of China.

9 UNCSTD: a success to be confirmed

The verdict on UNCSTD must wait until the action begins, says Jean-Marc Fleury.

10 Crops and cropping systems close-up

Four views from four different parts of the world on crops and how they are grown and managed ... a new grain in Kenya, pastures in Peru, machinery in Egypt, "trees" in the Philippines.

18 No news is not good news

Dennis Schroeder surveyed Canadian media and found them largely indifferent to development. Mark Gerzon tells how *WorldPaper* seeks to fill a news gap to become the first "global community newspaper."

20 Making health a household word

Michelle Hibler describes how Guatemalan researchers are strengthening the role of education in health care.

22 Briefs

People, projects, events

24 Commentary

William Ellis calls for a "new age" of development, based on a people-to-people network.

25 Oyster farming in the tropics

A photofeature and commentary on a new film.

26 New publications

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The poor create tomorrow's cities

Jean-Marc Fleury

Do not look for the city of the future in science fiction novels. You have only to go to Manila, Lusaka, San Salvador or other Third World cities to see it being shaped from meagre resources by the imagination and sweat of the poor. A glance will tell you that this city of the future bears no resemblance whatsoever to the automated glass and steel creations of futurists.

"I'm afraid to say," states Dr A.A. Laquian, expert on urban questions, "that the poor will have to build their own cities. They will also have to collect their own garbage, sweep their own streets, and be their own policemen and firemen."

Because of a phenomenal migration of the rural poor to the cities, the poor are coming to constitute the majority of the urban population in developing countries. If the present rate of urbanization continues, it is predicted that in the year 2000, of the 52 cities that will have a population of more than 5 million by then, 40 will be in the Third World. Unable to generate the surplus necessary to construct cities designed for the rich, most of the new city dwellers will have no choice but to build and run their cities themselves.

The concept of a city built and managed by the majority of its inhabitants is not new by any means. The Latin American sociologist Jorge Hardy talked about it long before the famous Habitat conference in Vancouver in 1976. What is new is that the ideas and models that were much discussed at Habitat have since been transformed into a large low-cost housing program administered by the World Bank, and its success is being confirmed for millions of people.

However, this achievement leaves a bitter taste in the mouths of politicians and dashes many fond hopes. Heads of state would prefer to inaugurate lovely avenues of bungalows, and heads of households, poor as they may be, still dream of a home to fill them with pride. All that the "sites and services" programs promise the poor is the renovation of their slums, a serviced lot, or the shell of a small house. It is not surprising that the promoters are occasionally accused of perpetuating unacceptable slum conditions. But are there any other solutions likely to bring needy city dwellers essential services?

Three-quarters of the inhabitants of the Third World countries cannot afford housing now being built by the private sector. Some manage to find lodgings through public loan programs and low-rent construction projects. But for millions fresh from the country, the precariousness of their financial situation bars them from any access to official housing programs. Lacking training and permanent employment, the newcomers remain on the fringe of society. Their only choice is to build makeshift dwellings on illegally occupied land — become squatters — or to crowd into slums. Attempts have been made to discourage migration to the cities by allowing the newcomers to stagnate in filthy shantytowns. Some municipalities have tried to force them to leave; governments have even granted them land on the outskirts of the city. All this has been in vain. The poor return to settle near the city core where they have a better chance of finding work.

Ignoring the problem is not a solution, so municipal authorities have taken a more innovative approach, first by

making better located lots available to squatters, then by equipping the lots with sanitary services and electricity. Experience has helped them refine the serviced lot projects to the point of making them a worthwhile solution to the problem of housing the poor. Now there are dozens of sites with a whole range of services, from a simple vacant lot to a small, permanent house. Indiscriminately razing slums to the ground has also stopped. After years of agonizing deliberation as to whether it was reasonable to base community development on slums, planners decided to grant loans for renovation and to bring water, sewers, and electricity to shantytowns. These programs are certainly not the stuff of grand ambitions for either planners or householders, but they do constitute a realistic way of bringing essential services to poor city dwellers and a very efficient method of integrating fringe populations with the rest of the society.

In the face of these achievements, the World Bank decided to extend financing to more than just large physical infrastructure projects, and in the early 1970s, undertook support for such social projects. In doing so, the financial institution made sure that the housing schemes would be replicable, through the provision of low interest and long term loans and a lowering of standards so poor people would be able to pay for their house. Wary of such new adventures, the Bank put a great deal of emphasis on assessment. For its part, the IDRC saw these projects as opportunities to train researchers from developing countries in the field of urban planning. The IDRC and the World Bank decided to finance jointly groups of researchers from the Third World who



Photos: Neill McKee

would assess the projects under way in their countries. This joint program has been in progress for four years. Last October, the Sixth IDRC-World Bank Conference on the Monitoring and Evaluation of Urban Development Projects was held in Ottawa, attended by researchers and project administrators.

Of all the sites and services projects discussed, several of the most successful were located in El Salvador, a small, populous Central American country. A private organization, the Fundacion Salvadorena de Desarrollo y Vivienda Minima (Salvadoran Foundation for Development and Low-cost Housing), administers a very ambitious program there. The Fundacion is well aware that the housing problem goes beyond bricks and mortar, and it uses its construction projects to offer maximum possibilities for slum dwellers to become full-fledged members of the community. Its philosophy is based on mutual aid, which unites families in all kinds of community work, and on the principle of gradual improvement closely linked to the first notion. First, contractors do the major housing work. This is followed by the mutual aid stage, during which the participants do much of the remaining work not requiring professional skills. Finally, the small unfinished houses produced are allotted at random and each family becomes individually responsible for completing its home. Mr Mauricio Silva, project manager at the Fundacion, estimates that his agency's projects represent nearly 30 percent of the houses built in El Salvador. Last fall 12 000 units were under construction.

The houses in the Salvadoran program are built on new sites at the outskirts of cities. Although it is very popular, the program requires purchasing land that inflation and speculation are making increasingly expensive. It also requires that municipal authorities rearrange their priorities, as they must suddenly extend municipal services to poor populations who had previously been ignored. Setting new priorities in this way is not easy. Occasionally a site is not connected to the water system until a year and a half after it has been occupied. The increasing costs of extending telephone and electrical service, public transportation, garbage collection, and water and sewer networks to the new sites have forced planners to seek alternative solutions. A policy of restoring existing structures has become necessary because, in spite of their precariousness, slum dwellings frequently offer the advantage of being close to employment and require less investment in terms of land.

In the bustling Manila neighbourhood of Tondo, the largest shantytown in Southeast Asia, 27 500 families are crowded onto 137 hectares. Here the policy of renovating slum dwellings has perhaps been put to the real test. These families have an average monthly income of \$us57, and live in 17 500 of

what government reports euphemistically call, "structures", built on unhealthy land originally set aside for expansion of the Manila Bay harbour.

The first problem to be resolved was the illegal occupation of the land by the squatters. Since they lived under the perpetual threat of expulsion, it was unrealistic to expect them to invest in their lodgings. Officials began by dividing sections of the shantytown into parcels of 30 to 96 metres square, that they sold for less than a dollar per square metre, payable over 25 years. Next, they presented the population with three possible ways of rationalizing land use. The first changed the arrangement of the structures only slightly, the second involved moving 25 to 50 percent of the houses, and the third required moving up to 75 percent of them.

To the great surprise of the authorities, the squatters have most often chosen the third option because it offers the most harmonious arrangement of lots, and provides a better road system, and allows maximum space for schools and markets. Once the land-use plan is accepted, contractors do the major work on water mains and sewers. However, the population itself decides the assignment of lots and there is no shortage of able bodies when the time comes to move structures.

The families begin improvements on their homes as soon as they have been relocated, or granted the parcel of land they already occupy. They are loaned up to a maximum of \$475 to buy wood, sheets of galvanized iron, nails, and other materials. Several community groups also assist, and small gardens, fences, and flowers soon transform the physical appearance of the renovated sections. By the summer of 1979, 3000 units had been renovated and 20 percent of the homes had been transformed into elegant little two-storey houses of concrete blocks.

Ultimately, of the 170 000 Tondo residents, approximately 22 000 will have to be moved to a site 3 kilometres away. They will have the choice of a serviced lot (water, sewers, and electricity) or a lot with an unfinished house (two walls and a roof). The project also includes training centres in employment sectors with immediate prospects: recycling scrap iron, manufacturing baskets, and crafts.

Having surmounted some initial difficulties, the Tondo project has earned the unfailing support of the squatters, who pressure the authorities to renovate their areas. The project has also shown that renovating existing structures causes less social upheaval than relocating families to peripheral sites. However, since renovation requires clearing space for streets and community facilities, approximately a quarter of the inhabitants must inevitably be relocated. Thus, far from being mutually exclusive, renovation and relocation are complemen-



Photo: A.I.S. Rao

Settlements in (from top) Botswana, Senegal, and El Salvador ... "not the stuff of grand ambitions for either planners or householders." Urban resources are stretched to the limit, and low-cost housing must become largely a case of the poor helping themselves.

tary activities.

The World Bank is now financing many low-cost housing projects besides those in El Salvador and the Philippines. The very first one was launched in Dakar, Senegal, in 1970, but it got off to a rather slow start. After 9 years, construction has begun on only 2500 of the 10 500 available lots, and barely 200 families are living in their homes. In Lusaka, Zambia, however, another sites and services project was highly successful. In four years some 7600 homes had been built at an average cost of \$825. Through the cooperative efforts of the IDRC and the World Bank, the projects in El Salvador, the Philippines, Senegal, and Zambia have been thoroughly assessed. At last October's meeting, with representatives of Indonesia, Kenya, Panama, and Colombia looking on, the researchers and administrators were able to begin sketching an overall picture of their experiences.

There was a very clear consensus in favour of public participation. In El Salvador especially, the results proved that from a strictly economic point of view, the mutual aid system reduced construction costs by \$400 to \$600, which is 50 percent of the cost of building a small house. Even if participation in community work entails loss of income, the families feel that this loss is easily offset by the opportunity of obtaining a home they could never afford otherwise. In Senegal, however, construction by the inhabitants has meant only negligible savings so far — from 10 to 20 percent according to Senegalese authorities, who plan to assign an independent labourer to each family from the start. In Zambia, the authorities prefer to channel public participation toward the manufacture of concrete blocks, which are in great demand — even if the quality occasionally leaves something to be desired — rather than toward construction itself.

It seems that the important factor is that families who will have to live together in the new or improved neighbourhood have the opportunity to get to know one another by working together. Once a community spirit has been firmly established, municipal authorities feel that the loans will be paid back more quickly, so that funds will be available to launch other projects.

Although it is a matter for discussion in the case of provision of new sites, public participation is unavoidable in projects for renovating existing structures. Squatters have often had to join forces against the authorities trying to evict them, and it would be unrealistic to completely reshape their environment without seeking their cooperation. In Tondo, Dr Laquian credits the researchers with having legitimized public cooperation in the eyes of planners and officials, who are most often technocrats, engineers, or architects. "They put a lot of emphasis on construction standards and straight roads," he says. "The social scientists,

on the other hand, see the situation from the point of view of anthropologists." The researchers thus explained to the project administrators that brothers, sisters, children, and parents were usually neighbours, and that the small shopkeepers lived in the midst of their clientele. By randomly matching the parcels of land and the names of families to be relocated, they would be causing all kinds of social upheaval. Rather than cling to the illusion of cold objectivity, the researchers recommend that administrators allow the people to decide the allocation of lots among themselves. "If they encounter problems they will have only themselves to blame," the researchers said. Thus, as the project progressed, the administrators acted more as technical advisers, explaining the specifications to be met and allowing the community to assume increasing responsibility.

Today, the population of Tondo has taken over the renovation project and has defended it on many occasions against untimely intervention by the authorities. The only problem in terms of participation is that single mothers, who make up a significant proportion of poor households, have difficulty getting out to participate in collective work. The administrators who gathered in Ottawa indicated that they were aware of this problem.

The researchers also played an essential role in determining the strata of the population being reached. Their main concern was that the poor might eventually be bought out by the upper classes. Fortunately, these fears are unfounded in most cases. In the Philippines and El Salvador, studies show that the population in serviced lot areas is more stable, so the poor are not being forced out because of the improvements made. In Zambia, however, where the authorities claim that the projects remain accessible to 95 percent of the population, a growing number of occupants have twice the income of those for whom the project was designed. Representatives of the World Bank feel that the situation will resolve itself as the number of available units increases. However, it is agreed that the middle class in Zambia is taking sites intended for the poor because it can find nothing better.

The researchers found that shantytown dwellers and squatters had higher incomes than initial estimates suggested. Relatives in the country often contribute financially in order to have a roof in the city, which is very useful when it comes time to send a child to school there. Experience also shows that very poor families manage to make ends meet by planning extra rooms that they rent out, often to even poorer families incapable of purchasing property.

Assessing the impact of the projects tests the imagination of the researchers where methodology is concerned. Some physical improvements speak for them-

selves, but how does one translate into statistics the claims of Tondo residents that, for example, crime has decreased, or that people no longer throw their garbage out the windows, or that they are more tolerant toward one another? Zambian authorities insist that the health of families is improving, but they have not succeeded in showing this, although there is no question that the streets facilitate visits from medical and health personnel. There are no satisfactory statistics on job creation either, although most of the families do hire workers at some point. One thing is certain, however: municipal authorities see the demand for urban services increase suddenly with the servicing of sites. Their difficulties in meeting this demand are such that participants in the October meeting suggested that research be conducted on ways to assist them.

Mr Anthony Churchill, director of the urban projects department of the World Bank, told participants that the sites and services formula, whether it involves renovated slums or serviced sites, had proved itself. Although the project administrators had corrected many errors along the way, Mr Churchill thanked the researchers for their contribution and encouraged them not to be obsessed about the deficiencies of the first projects. "The Bank," he said, "is now working on second generation projects that include grants to municipalities to accelerate the extension of municipal services." Each year it lends between \$500 and \$600 million for sites and services projects, providing homes for at least a million people annually. The Bank hopes that in the near future more than five million people will find homes through these projects. However, Mr Churchill admitted this will still represent a fraction of the one billion additional citizens Third World cities must shelter between 1975 and the year 2000.

In 1976, IDRC published a book entitled *Catastrophe or New Society?* in which a group of Latin American scientists (including Jorge Hardoy) proposed a plan for universal housing. The average cost of a house in the Third World, 50 square metres with two bedrooms and sanitary services, was estimated at \$1750. The extent to which these forecasts coincide with the achievement of sites and services projects is striking.

On the project sites — which, whether we like it or not, are the blueprints of tomorrow's cities — the houses cost on average less than \$2000. They occupy a site averaging 32 square metres in Tondo, 74 square metres in El Salvador, and 350 square metres in Africa. The monthly payments made by house owners vary from \$10 to \$15, and the monthly payments on loans for renovations to "structures" rarely exceed \$1 or \$2. A room is usually rented for approximately \$5 a month. Furthermore, without having recourse to costly high-rises, projects are sure of attaining

economical densities and preserving precious arable land simply by encouraging construction of two- or three-storey houses. In El Salvador a density rate of 90 families per hectare is already being attained without exceeding two-storey buildings.

Dr Laquian is convinced that building their own homes is the only hope for decently housing the Third World poor, who constitute from one-third to three-quarters of the citizens of developing countries. Besides building their own cities, they will also have to run them, which will necessitate, among other things, rethinking municipal services equipment. For example, there will be no question of purchasing magnificent fire trucks equipped with pressure hoses. Rather, the people will have to use their own equipment and count on their own manpower to put out fires. Because all this involves a great deal of dialogue between the residents and the authorities of these self-built cities, Laquian hopes that more research will be carried out on the social structure and dynamics of shantytown and slum communities.

In spite of the fact that the sites and services projects have dealt a cruel blow to many cherished dreams, there is a great promise for the future: in building their own cities the poor will perhaps form strong, dynamic communities. As long as they do not become caught up in the pursuit of solely personal gain, but take their society in hand, the poor will make of each low-cost housing project the seeds of change for urban poor. As one participant in a project in El Salvador said, "The project not only enabled me to have a house, it also taught me to speak in public." □

Information sciences:

China retrieves a tradition

Kieran Broadbent

Mr K.P. Broadbent, Program Officer with IDRC's Information Sciences Division, travelled to China earlier this past year with the Chinese English Translation Advisory Group. Fluent in Chinese, Mr Broadbent is the author of A Chinese-English dictionary of China's rural economy.

This article, extracted from Mr Broadbent's trip report, gives an overview of the state of library and information services in the People's Republic of China. The full report will be published in IDRC's monograph series early in 1980.

I nformation retrieval has a long history in China. For instance, the Chinese recognized the close connection between food and population as early as 1368 AD when the first Ming emperor, Tai Tsu, decreed that a Yellow Register be compiled every ten years giving the number of mouths to be fed in each household.

The cataloguing of books was undertaken as early as the 1st century AD when Liu Shang started compiling the dynastic bibliographies in a systematic manner that set the standard for later librarians in China. Descriptive and subject cataloguing began as early as 70 BC and the first library collections are said to date back to 2697 BC.

In 1949, the People's Republic of China (PRC) inherited a wealth of library resources and tradition that had hitherto been accessible only to scholars and the literati. But despite the establishment of public libraries in 1912, the facilities were generally inadequate and poorly endowed. The low level of literacy also meant that the users were limited to a minority of educated people.

The political events had hindered the development of library and information services at a time when the demand for more accurate information resources was growing. Information services had, in fact, traditionally held an esoteric position in China, a position that was intensified during the past two decades, and librarians and information scientists have occupied an ambiguous position in the face of social and political forces.

From 1966 to 1976, during the Cultural Revolution in China, libraries were closed, books were burned, and teachers were dispersed to the countryside, events having far-reaching effects on the whole area of science and technology and the dissemination of information.

Today, however, the growing realization of the need for greater communication to advance the pace of modern-

ization is creating a new emphasis on the development of library and information services. There is also a growing awareness of the need to interact and collaborate with other countries and communicate with foreign scientists, as well as a new realization of the benefits to be gained in cooperating with well-proven international systems.

The three years since Mao's death have, in fact, been marked by a movement towards greater liberalization. The PRC has committed itself to a vigorous and ambitious program called the four modernizations — in agriculture, industry, education, and science and technology. The Outline National Plan for the Development of Science 1978–1985 sets four broad goals: to approach or attain advanced world levels of the 1970s in important branches of science and technology; increase the number of researchers to 800 000; build up new centres of excellence; and build up a nationwide scientific and technological program. This last area includes the strengthening of library resources, the provision of data banks, documentation, and computer applications to information retrieval.

Libraries in the modern sense have had a relatively recent history and the concept of user-oriented libraries still has no real meaning today. The first public libraries established in 1912, after the 1911 revolution, were confined to the large urban centres — Peking, Nanking, Shanghai, Wuhan, etc. There are currently about 200 libraries, but only about a dozen can be considered of a size suitable for providing practical modern services.

The Peking library, for example, was built in 1910. Its main collection, however, predates this period and can be traced to the Ming Dynasty, some 500 years ago. Designated as the National Library in 1958, its present holdings are estimated to be about 10 million volumes, 40 percent of them in foreign languages (mainly English, Russian, and Japanese). The main and Western catalogues are said to be receiving some 2000 volumes a month and the English language section contains some 3000 new acquisitions recently catalogued, with only a minor backlog.

Up to now various methods have been used to catalogue documents. The Chinese Academy of Sciences (CAS) devised a system in 1958, the Ministry of Culture designed a scheme for neighbourhood libraries, and some libraries have adopted the Universal Decimal Classification (UDC). Recent efforts have been made to standardize classification methods. A method similar to the Library of Congress, called the Chinese Classification System, was introduced in 1970 for foreign collections. The classification scheme for Chinese material is a decimal system with *pinyin* romanization (roman script translation of Chinese characters). Older cards, however, have no *pinyin*. New cards are printed with

pinyin for the main entry with tonal diacriticals. Separate romanization is given for each character with no word combinations. This seems to indicate the transitory nature of the main catalogue as well as official uncertainty about correct use of *pinyin* for subject entries.

Library mechanization has not been implemented in China except for the Nanking University Library where, in April 1979, a small experimental machine cataloguing exercise began using a set of Machine Readable Cataloguing (MARC) tapes supplied by the Library of Congress. The object of the trial is to adapt the tapes to local hardware. The work on hand is restricted to about 400 English-language documents. Cataloguing of Chinese books is not being contemplated because of encoding difficulties. Library mechanization elsewhere is in the planning stages only.

The Peking Library, together with the Shanghai Library which has a collection of 6.5 million books, forms the nucleus of the present national library structure. The network fell into decay between 1966 and 1976 and cannot be said to operate effectively at the present time. The system of interlibrary loans is basically operated by these two libraries and the system is restricted to a few government institutions. The overall coordination and planning of the national library network comes under the Council of Scientific Libraries.

Librarianship as a profession is hardly established even today. We were told that Peking University Library School offers the only modern course available at present, and courses in information science and computer technology are being introduced. Most educators have given a low priority to the profession, feeling it easier to train middle-school graduates to catalogue and compile books, and compile crude bibliographies than to attempt to train graduates or subject specialists to take over design, application, and growth of libraries.

The present political climate, however, has revived an interest in librarianship and documentation, and training in information science is considered an integral part of the four modernizations. It appears that each major library wants to modernize as rapidly as possible. Three major obstacles are hindering the process: the lack of trained personnel, the lack of library resources to effectively operate user-oriented services, and the division between Chinese- and English-language publications.

China hopes to catch up, nevertheless, and is stepping up its training program. There is some evidence that reader services are being extended. With a broad latitude to collect new books on different subjects, Chinese librarians will have more scope for developing user services in some areas. There is a great deal of work to be done, however, on restoring collections in areas affected by the policies of the Cultural Revolution.

Although libraries have a long history in China, information and documentation are relatively new areas of development. The All China Association for the Dissemination of Scientific and Technical Knowledge was established in 1950 to help disseminate current information and increase communication between scientists. At the same time, the Institute of Scientific and Technical Information was founded in 1956 to act as a clearing house for scientific information and serve user needs on a nationwide basis. It also had, as a novel side role, the responsibility for supplying items of technical equipment. By the early 1960s, dissemination of information was a centralized process unified within the state structure.

The major source of dissemination of foreign literature has been the Institute of Scientific and Technical Information, recently renamed the Institute of Scientific and Technical Information of China (ISTIC). In addition to acquiring and distributing foreign literature within China, its functions include indexing scientific publications, abstracting, and translation. It also publishes scientific texts, which account for the largest part of materials published in China.



The Peking Library. Information sciences in China are emerging from a period of suspicion and neglect.

In 1966 the Cultural Revolution severely impaired information and documentation. The publication of scientific and scholarly journals was brought to a halt. The exchange of Chinese materials abroad ceased altogether. Many foreign libraries responded in kind and library resources in China began to stagnate. There was some disruption at ISTIC that impaired the work of documentation and it is evident that abstracting and indexing slowed down.

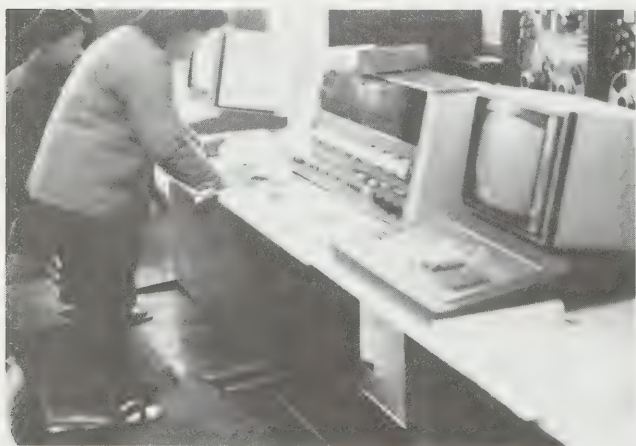
ISTIC has received a new impetus under the modernization program. It now has a staff of 1500 and its functions are to collect scientific and technical information from China and outside, index, abstract and edit materials, translate, and selectively disseminate the information. It presently maintains exchanges with 63 countries, 53 international organizations, and 2000 institutions. In 1978 it compiled and published some 10 million titles, mainly in its indexing and abstracting journals, and conducted literature searches in some 90 special subject areas as well as translating close to two million items and publishing some 6.7 million research reports.

The current policy of the Institute is to stress document availability and it is currently operating a current awareness list backed up with journal circulation and photocopy services, a microfiche service, and patent searches.

Several problems are hindering its development, however. The location, size, and facilities of its present quarters are inadequate. Technical knowhow is lacking to introduce a fully computerized information retrieval system. Last is the problem of translation. The nature of the Chinese language itself is a major problem confronting processing by computer. The 5000 basic characters needed for normal translation purposes, and the further 3 to 4 thousand needed to cover scientific terms and concepts, are far too numerous to be easily utilized by computer. Research in this area is ongoing and a great deal of effort is being made to reform the written language. Plans are also in hand to help scientists who can read foreign languages by making primary documents published in other languages more widely available.

In order to bridge this gap, it has been decided to opt for one conventional language, English, for the transfer of scientific information. English language teaching is therefore being pushed at all levels of society.

Information storage and retrieval is presently carried out by hand. English and Chinese materials are handled separately because of the translation problems and a dual service operates. ISTIC is interested in developing a separate computer system for its English-language materials and it is hoped that the staff will be able to train abroad in modern documentation techniques.



Experiments test the feasibility of computerized storage and retrieval for Chinese- and English-language documents.

Research into methodology is currently very important. By 1985, China hopes to set up data banks and information analysis centres in various disciplines. It would join, through Unesco and FAO, international systems like NATIS (National Information Systems) and AGRIS (International Information System for the Agricultural Sciences and Technology). It is also possible that China will implement some foreign systems, as software compatibility is a major problem. China has recently imported a few IBM computers and others compatible with its software. Storage and retrieval of both Chinese and English-language documents is being tested on these machines. An automatic type-setting program and software are being developed to handle profiles of specific scientific data bases. A thesaurus for an agricultural data base is three-quarters completed and machine translation of French and German texts is carried out as ongoing research with other institutions.

ISTIC maintains a small training program in information and documentation in Peking. Students are mainly computer, mathematics, or physics graduates. Students and information scientists from the institute are also being sent abroad for training.

The problems of dealing with a growing body of both indigenous and foreign literature now appears daunting to the Chinese. Until the last two years, China has been effectively insulated from the massive problems of storage and retrieval elsewhere.

Books are a scarce resource in China today because of the shortage of paper. The present policy is to publish small quantities of a large number of titles. Many items are consequently sold out immediately and libraries rarely get more than one copy, even of basic textbooks. Foreign texts are very scarce and more often than not are unobtainable, even in libraries. Another limiting factor governing the awareness of literature and dissemination of information is that traditionally most of the costs have had to be borne by local governments, many of which cannot afford such programs.

The current reorganization of education, research, and information services re-emphasizes the basic need for access to literature, particularly foreign literature. Authorship is no longer being discouraged and publication of research results has brought about the reappearance of many of the former academic journals and a few new ones. A conference of the Chinese Academy of Sciences held in 1978, in Peking, set out to evaluate library resources and the needs of the schools and university libraries. A review of textbooks for various courses was made. Currently, China is seeking to identify the main texts used at major Western universities and make these available at institutions throughout the country.

In summary, we can say that the development of information services, access to literature, and library development have taken place in a relatively short period of time, in a largely uncoordinated fashion, and have been the subject of intense political pressures. There is a good foundation for institution-building, however, but information resources need to be coordinated and rationalized with more effective functioning of activities at individual levels.

The planning and development of new services and the rationalization of existing ones require first of all access to knowledge, equipment and training outside of China so that the loss of one decade, which happened with Cultural Revolution, can be made up. Information systems are now receiving priority planning and there are indications of a new commitment to catch up with the West by the year 2000. Immediate development will be hindered by the lack of resources, however, particularly with regard to libraries and provision of corresponding user services.

One left China with the impression that the scientists were extremely capable persons, resourceful, innovative, and extremely dedicated. There is a feeling of confidence among the people that things will get better in China. □

UNCSTD

a success to be confirmed



By the time this issue of *IDRC Reports* is published, the developing countries should be in a position to calculate exactly what they can hope to derive from the United Nations Conference on Science and Technology for Development (UNCSTD), held in Vienna last August.

At the close of the conference, delegates from the 130 participating countries agreed to hold a "pledging conference" before the end of 1979 in order to collect a minimum of \$250 million for a "science and technology for development fund". Agreement on the creation of this fund was one of the major results of the conference.

Despite years of preparation, thousands of reports, hundreds of preliminary meetings, and two weeks of debate — including several sessions that continued long into the night — much remains to be done before it can be said that UNCSTD was truly a major step toward a new international scientific and technological order. Yet as soon as the conference closed in the early hours of Saturday, September 1, observers spoke of it as being a "moderate success". Despite the defeatist attitude adopted by many people every time the United Nations announces plans for a world conference, representatives of industrialized and less-developed nations succeeded in reaching an agreement in Vienna on several of the main requests formulated by the developing world.

Third World countries will have the final word on the spending of resources from the new fund designed to strengthen their technical and scientific capacities. Their view will be expressed by a new intergovernmental committee on science and technology for development, on which delegates from all countries will sit. Composed of high-level representatives, the committee will seek to formulate major policies for the various UN organizations active in the field of science and technology. Specifically, it will establish guidelines for the fund or — to use the official term — "financing mechanisms". However, until these mechanisms are set up on a permanent basis, a provisional fund of \$250 million, administered by the United Nations Development Program (UNDP), will be

created for 1980 and 1981. The intergovernmental committee will use this time to advantage by recommending to the General Assembly the establishment of a permanent body to take over management of the fund.

However, the developing countries had been hoping for a great deal more in terms of financial commitments. The \$250 million objective, which has yet to be reached, has already been qualified as "crumbs from the rich man's table". The proposed sum seems ridiculously small, compared with annual world expenditures of about \$150 billion on research and development, and the initial requests for \$2 billion in 1985 and \$4 billion in 1990. Furthermore, the Group of 77 asked that these sums be collected "automatically" by taxing the surpluses amassed by industrialized countries through trade with developing nations. However, the wealthy countries rejected outright the principle of automatic contributions.

The overall objective of UNCSTD was to "strengthen the scientific and technological capacities of developing countries", therefore the funds provided should be made available to Third World governments and institutions. Moreover, the conference outlined in detail means of using these monetary resources in a series of recommendations known as the Vienna Program. The first recommendation advises authorities in developing countries to formulate national science and technology policies without delay. The Program then suggests the establishment of vital infrastructures — information systems, standardization bureaux, and measurement services and laboratories. Developing countries are invited to collaborate, to exchange information, and to work out a common policy with respect to transnational corporations, holders of an increasingly large share of the world's technology. The Vienna Program also emphasizes the importance of reaffirming the value of science and encouraging young people to take an interest in science and technology through wider dissemination and popularization of scientific information courses. Despite the numerous recommendations that are too ambitious for many poor countries, the

Vienna Program nevertheless constitutes a valid statement of the major objectives to be reached by any country wishing to build a future based on science and technology.

The developing countries also advanced a proposal at the conference to establish an international scientific and technological information system to meet their needs. They thereby hoped to obtain information about supply sources and the detailed structure of technology costs so that they could then take a sophisticated, knowledgeable approach when "shopping" for technology and bargain more easily with the various suppliers of technology.

The principle of a system such as this was accepted in Vienna, but the industrialized countries refused to make any promises about the availability of information on technology cost structures — information that is largely in the hands of the transnational corporations. As expected, they were also opposed to the idea that any country obtaining such information should make it available free of charge to other countries through the system. Such action, they claimed, would run counter to national and international laws requiring confidentiality of information. The establishment of this system, the centre of which will be part of the UN organizational structure, should nevertheless give rise to major programs aimed at developing national systems. The main centre will have to depend on many national and regional subcentres.

UNCSTD's achievements may appear insignificant to those who want a new international scientific and technological order. This is especially so on the eve of a new "telematics" revolution that could increase the disparities caused by the varying levels of industrialization throughout the world. However, the fact remains that if politicians and scientists are able to use to advantage the relatively small amount of money that will be made available to them in 1980 and 1981, they will probably succeed in breaking through the wall of scepticism that has become the wealthy countries' main excuse for turning a deaf ear to the demands of the Third World. □

Jean-Marc Fleury



A miracle is made ordinary

Rowan Shirkie

Almost exactly on the equator in Africa, near the small agricultural town of Njoro in the heart of the wheat growing district of Kenya, a rich, lush looking grain crop ripples and whispers in the warm breeze. Standing near the edge of the field, Bernard Wabwoto cups one of the plump bearded heads of grain in his hand, and with a few deft twists gives it the critical scrutiny of a professional plant breeder. "This is our best triticale," he says, looking up across the field, "We're releasing it to farmers for the next season."

For Dr Wabwoto and his colleagues at the Njoro National Plant Breeding Station in Kenya, it is the culmination of 10 years of painstaking, patient work. Triticale is a cross between durum wheat and rye, the first artificially created crop plant. Such are its potentials in terms of yield, growing capabilities, and protein balance and content, that in the first stages of its development, triticale was dubbed "miracle grain" and "super plant", and was hailed as the great provider for a hungry world. The exhilaration of discovery soon gave way to a more cautious optimism, as scientists realized that the new cereal was not — wild hope — perfect.

Triticale is a hybrid produced by crossing wheat and rye: its name is drawn from the Latin for wheat (*Triticum*) and rye (*Secale*). Triticale combines the high protein content of wheat with the high lysine (an essential amino acid affecting the quality of cereal protein) content of rye, the good yield characteristics of wheat with the hardness of rye. But because wheat and rye come from two different plant groups there was some genetic incompatibility in their marriage. Triticale, the offspring, was for many years plagued by sterility. It inherited only a single set of chromosomes from each parent, and two such unique sets cannot pair for reproduction. Until the discovery in 1937 of a chemical treat-

ment that caused the two parent chromosome sets to double within the triticale, it could not reproduce itself from seed.

Much of the early work on triticale was done at the University of Manitoba, and as progress was made, collaborative links with organizations such as the International Wheat and Maize Improvement Centre (CIMMYT) in Mexico led to larger international programs. With funding provided by Canada and managed through IDRC, the collaboration between Manitoba and CIMMYT was turned toward a Triticale Project, and the search began for ways to use the crop for the benefit of developing countries. Triticale first came to Njoro in 1967 with a group of plant scientists from the University of Manitoba, as part of a technical cooperation program.

At first, triticale did not do well. Because they were derived from temperate zone parents adapted to higher latitudes and longer days, the first varieties were maturing too late in the short, regular, equatorial days of Kenya. And as many of the early triticales came from tall, weak-strawed parents, the tropical sun encouraged them to grow even taller and weaker. Grain shrivelling, which led to problems in fertility and caused difficulties in extracting flour during milling, was common. Similar problems were encountered in triticale programs in other parts of the world.

The reason was lack of history. Triticales did not have the thousands of years of opportunity to adapt and develop that wheats and other grains have had. In an effort to break this "time barrier", scientists mounted an international testing program, growing triticale in many locations around the world to accelerate its development and broaden its adaptation. By 1974, with the aid of an IDRC grant, Dr Wabwoto and his colleagues were participating in the network.

Kenya has been described as a "na-

tural rust laboratory" because it has the most species of this cereal fungal parasite in the world. The Kenyan breeding and selection program had two aims: to add better rust resistance to triticale's genetic makeup and to make the adaptations needed to establish it as an economic crop in Kenya.

Like many cereals, fertile triticale is normally a self-pollinating plant. To combine the desired characteristics of two separate varieties — a strong straw variety, for example, with a variety having plump grain but weak straw — a cross must be made between two parents. The anthers (male reproductive organs) must be removed from the plant selected to be the female parent before they are able to shed pollen. At flowering time, fresh pollen from the chosen male parent is transferred to the stigmas (female reproductive organs) of the emasculated plant, thus causing cross-fertilization. The seed produced from this cross will carry the genes of both parents.

The early generations often vary greatly in height, maturity, disease resistance, straw strength, and so on. This is termed segregation, the result of the separation and recombination of different genes. Sometimes only a single plant, or even a few good seeds on a head, will exhibit the qualities the breeder was seeking to produce. The plant materials must be grown and grown again until a pure line is developed. When all plants in a line have reached the state where they are producing uniform, readily recognizable characteristics, it is considered an advanced line or strain. Finally, when licensed and released through seed companies to farmers, the strain is called a variety or cultivar.

"Notoriously poor in adaptation", when the international testing program was begun in 1969, triticale yields averaged only about 75 percent those of the wheats grown with them for comparison. By the end of 1978, triticale was being grown in 83 countries for testing in 400 locations. Average yields outstripped the top wheats by 20-30 percent. In Kenya, triticale consistently outperforms wheat by 20-40 percent, and in one trial, held during a drought, triticale outyielded wheat by 60 percent.

Triticale now seems to be moving into its evolutionary niche. It adapts better than wheats to acidic tropical soils, which are often characterized by toxic levels of copper and aluminium that may inhibit growth in other plants. It has a distinct advantage in dry zones, and at higher altitudes where cool evening temperatures can affect the vigour of crops.

After ten years of crossing, selecting, screening, yield and field trials, it can now be said that triticale and Kenya were made for one another. Seventy percent of Kenya's total land area of 57 million hectares is semi-arid. Popu-

lation pressure and landholding patterns have forced people to move onto marginal areas where rainfall is unreliable and poorly distributed, and the danger of drought and crop failure is great.

At the same time, Kenya's wheat requirements continue to rise and domestic production falls further and further behind consumer needs and demands. A poor harvest this year has meant that the country's wheat imports — an expensive item in an economy already under pressure — will reach record levels.

Necessity is pushing triticale out of Dr Wabwoto's experimental plots and into farmer's fields and consumer's plates.

The basic problems of adaptability, fertility, disease resistance, and yield have largely been resolved. The most persistent problem, grain shrivelling, is giving way before new varieties recently introduced into breeding programs.

Dr Mathias Oggema, Director of the Njoro station, clears a space among the stacks of papers and notebooks that cover his desk. He laces his fingers and rests his hands on the cleared patch, pausing a moment before speaking. "The biggest obstacle that faces triticale now is an economic one," he says carefully.

As it moves into the grain market, Dr Oggema feels triticale must become more attractive to farmers, millers, bakers, and consumers. A producer price must be negotiated so that farmers will be assured a good return and encouraged to plant more hectares to triticale. Yet it must not be so attractive as to further disrupt already uncer-

Triticale harvest. Many promises, many problems for a new grain.



Photo: Neill McKee

tain wheat production. Wheat and triticale are not likely to compete for the same land, however, as triticale was designed to extend production onto the marginal lands of smaller farmers.

It is also vital that triticale gain consumer acceptance soon. Like utility wheats and other grains, triticale can be used as animal feed, and it is already being grown for use in poultry and cattle rations in Kenya. If it becomes identified as animal food before it is recognized as food for people, its introduction as a food crop may be hindered. (Corn met a similar resis-

tance in Canada with new immigrants from Europe who knew it only as a fodder crop).

An excellent food, triticale's nutritive value exceeds that of either its wheat or rye parents. In fact, North American consumers pay a premium for triticale in bread and snacks sold as health or natural foods. Part of the reason why triticale is not more widely consumed in developing countries is that its baking and milling qualities are slightly different than wheat's, and the baking and milling industries in the developing countries are not familiar enough with the new grain to risk substituting it for imported wheat.

The wheat parent of the best triticales is a durum or "pasta" type rather than a more glutenous bread type. Gluten protein forms a flour dough that is elastic and bakes well. Ironically, the property that makes triticale less suitable for loaf bread makes it more appropriate than wheat in the traditional staple food of Kenya, *ugali*, a stiff porridge made from maize meal that can be enriched with other grain flours.

The industries are more likely to respond to consumer "pull" combined with scientific or governmental "push". The IDRC is therefore supporting a small project of the Home Economics Department of Egerton College in Njoro to develop recipes using triticale to replace wheat in common foods, and to stimulate a demand for these products.

Still, consumers in developing countries are growing increasingly fond of Western style loaf bread. In addressing this demand, the Kenyan Ministry of Agriculture set up a steering committee to investigate the potentials of triticale use and production, and arranged with Dr Oggema for some of the best varieties to undergo commercial milling and baking trials early last spring. The grain performed well, with a good flour extraction rate at the mill and an acceptable loaf at the bakery.

The field where Bernard Wabwoto stood — by his estimate the largest field of triticale in Kenya and possibly in Africa — was being grown under contract for the station by a local farmer. The grain was slated for larger milling, baking and consumer trials, and as seed stock for other farmers. Unromantically called T-65, this was the best triticale. Two more varieties, T-14 and T-48, are ready for release, and behind them some 20 more varieties are waiting to have seed multiplied and distributed.

"We've done excellent work with triticale," Dr Oggema says, "...the best in Africa... the potential here is enormous for triticale."

For Dr Oggema and Bernard Wabwoto, the work that has gone before and the work that is ahead has been directed toward turning that potential into reality. Success will come from making the "miracle" ordinary. □



Photo: Rowan Shirkie

Roguing — weeding out nontypical or inferior triticale plants from a crop destined for use as seed.

A patch of green

Susana Amaya

During the dry season the two predominant colors in the landscape of the Libertador Ramon Castilla Community Agricultural Society (SAIS) are the yellow of the prairie and the blue of the sky. Bare rocks or rural hamlets occasionally appear as dark patches in the scene. Not far from two of these hamlets in the Sierra, the Central Peruvian mountain range, the visual monotony is broken by a green field. Such a bright green at an altitude of 4000 metres and in summer is hard to explain. It is the result of an "injection of technology" following an agreement between two Peruvian institutions — the SAIS and La Molina Agrarian University.

The *puna*, the dry bleak plateau in the high Andes, from 3000 metres up, has little agricultural value except for its natural pastures. Used for grazing, these pastures are of poor quality because they lack water and nutrients. The Peruvian Sierra encompasses about 20 million hectares on which most of the country's sheep, cattle and camelids (llamas) are raised. Sheep and camelids adapt best to the altitude, the climate and poor nutrition. Cattle, raised to a lesser extent, do not compete for the same food.

Centuries of overgrazing, water shortages, and severe lack of soil nutrients limit the potential of the Andean highlands for livestock raising. Nevertheless, a large proportion of Peru's rural population depends on livestock for its livelihood, as this region offers no other means of subsistence.

The SAIS (Sociedad Agrícola de Interés Social) is a special creation of the Peruvian land reform program. As part of that program, the SAIS Libertador Ramon Castilla — named in honor of Major-General Ramon Castilla, the famous liberator of the slaves in Peru — was established in August 1972. Seven farms were assigned to the rural communities of Tarmatambo and Pomacancha, and to the José Olaya Ltda. Cooperative Association No. 265, made up of former farm workers. These three groups formed a partnership whose lands cover more than 29 000 hectares, 22 000 of which are natural grasslands. More than 700 families live here — approximately 3600 people — making this particular SAIS one of the most densely populated.

During 1978-1979, the sheep population reached 23 687: there were also 1000 cows, 1200 *cuyes* (a breed of guinea pig), and 70 horses. The SAIS general manager, Justo M. Egoavil notes that "the area is not suitable for farming, and the only reason we plant is to provide work for members ... farming simply is not profitable in this environment." However, potatoes, barley, quinoa, oats, and vegetables are grown on a small scale.

As established by the Peruvian land reform program, the SAIS is governed by a delegate assembly that appoints two councils in charge of administration and supervision. There may also be other specialized councils. Production and general management are the responsibility of the administrative council. The nature and structure of the SAIS make

Sheep grazing the altiplano. "Farming simply is not profitable in this environment."



Photos: Jaime Rojas

possible the participation of the rural people involved. They are not individual land owners, nor do they hold deeds to the land. They receive salaries for their work, but also participate in the running of the society through their delegates. Profits or surpluses go to the participating communities and the cooperative association to improve schools, transportation, and other community services.

Although progress has been made in sheep raising — SAIS' main source of income — members are well aware of the limitations resulting from the lack of water and the deterioration of the grasslands. The technical assistance proposed by the University was very well received, therefore.

This then explains the enthusiasm with which La Molina and SAIS staff have undertaken the project, financially supported by IDRC. According to Mr Arturo Carrasco, director of the Animal Sciences program at the University and project leader, the project aims to improve the socio-economic conditions of the inhabitants through livestock raising. This goal is pursued primarily through the improvement of animal nutrition. "Improvement starts in the stomach," states Carrasco, and he adds that by improving nutrition, there is a 90 percent possibility of raising the level of production. It was soon found that there was a need to form an interdisciplinary team with specialists from La Molina University in soils, livestock raising, veterinary medicine, economics, and sociology.

SAIS Ramon Castilla, representative of this type of association in the Sierra, was chosen for the project because of its members' receptivity, and good access from Lima. Similar experiments are being conducted in Puno, in the South of Peru, under the guidance of a New Zealand team. Information is exchanged between these two groups, and the

ultimate aim is to disseminate the projects' results throughout the high Andean region.

The specific objectives of the project are to improve native pasture management techniques in the high Andes; introduce and evaluate new grass and legume forage species; introduce nutritional supplements and feed production systems during drought periods; and train personnel.

The project has two approaches: technology transfer and applied and demonstrative research. Under the agreement SAIS provides the land, animals, machinery, manpower, and lodgings for the University staff. For its part, the University directs research and its application, and finances the inputs, equipment, technical personnel, transportation, and the analysis and publication of results.

One starting point for the project involved a survey of the grasses and soils of the terrain using satellite photographs and 400 soil samples. Soils were then identified as being suitable for forestry, agriculture, or livestock raising; they were also identified in terms of their response to irrigation. At the same time, a comprehensive socioeconomic analysis of the SAIS that covered 50 to 60 percent of the region was done in order to analyze the two economic systems coexisting in the Society: the managerial one and the family one. The family economy is based on the *huaccha* —the raising of the rural dweller's own livestock, which in fact is very inferior in quality, on SAIS land. Mr Carrasco states that this type of livestock raising is still practiced nationally and is increasing, sometimes supplanting cooperative types of organizations. This phenomenon has also been observed in agriculture, and it represents a reversion to forms of family economy that predate the land reform program. The socioeconomic survey of the SAIS will make it possible to measure improvements resulting from the management methods introduced and to evaluate project results generally.

According to several researchers, one way to improve native pastures in the high Andes is to plant nitrogen-fixing legumes. However, this presents difficulties if attempted on a large scale. Fertilizing is another, albeit costly, possibility. Another alternative is to leave the pastureland fallow. Much research has been done on this question in England, Canada, the United States, and Brazil. Soil is compacted by constant trampling, which makes it impossible for roots to find nitrogen, consequently the roots only grow superficially and absorb little water and nutrients. The most economical way to restore the grasslands is to leave them inactive for a year or two. These ideas are currently being experimented with in the project, particularly that of introducing legumes.

One promising possibility is to plant exotic forage species that can survive in the high Andes. Some of them

had already been selected by the University in previous studies. Twenty hectares of the Paccha production unit were planted with English and Italian ryegrass and red and white clover in order to fatten 3000 sheep a year. This number represents about 40 percent of the annual surplus of rams. The mapping of the SAIS made it possible to detect 200 potentially irrigable hectares; an enormous potential that will totally change the course of the SAIS economy and will increase its profits severalfold. Of these, twenty centrally located hectares were chosen to serve as the starting and focal point. To obtain water, part of a canal dating from the Inca period was restored. Planting was done in January-February 1979 during the rainy season. According to many people, it is now the best pasture in the high Andes. Alfonso Briceno Ortega, the recently elected president of the SAIS administrative council, says that the initial effect of this assistance — the green pasture and the irrigation

ditches — was like a gift from heaven. Villagers from surrounding areas come to visit it and ask how it came to be. Some surreptitiously carry handfuls of green grass away with them at night for their *cuyes*.

Initially, surplus rams will graze on the twenty hectares, to be fattened 150 grams a day per animal. As a rule, such surpluses were sold during the dry season. The pasture currently under cultivation will later be enlarged for dairy farming: 200 hectares could sustain 1000 cows whose milk,



Alfonso Briceno Ortega

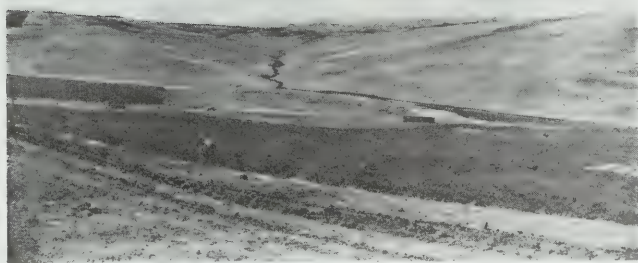
about ten litres a day per cow, would be processed locally. Two workers from the SAIS will be trained at La Molina University in making cheese for export. Twenty-five head of livestock can be grazed on each hectare of cultivated pasture, which contrasts with the one head per hectare on natural pastures. Thus, natural pastures will be given a rest, and the SAIS livestock capital will increase. Another important aspect is that the cultivated pastures require manpower: for every 25 hectares, 3 to 4 people are needed to irrigate, fertilize, fence, and care for the animals.

At present, the survival, growth, and persistence rates, as well as the production of dry matter and nutrients, are being evaluated for the Paccha pasture, as is the animal response to different loads and fertilization systems. Work is also being carried out to evaluate the improvement in animal nutrition through food supplements. One experiment used protein, vitamin, and mineral supplements with ewes bred for the first time. The effects, indicated by the weight and vigour of newborn lambs, are promising. The same type of nitrogen supplement experiment was begun using urea as a source, but toxicity problems have made it necessary to temporarily suspend this work.

Work is also being done on animal health, including the diagnosis of health problems and the evaluation of the sanitary controls employed by the SAIS. The work being done in this area is of great importance because it can substantiate the results of the nutrition work.

In the longer term, once technical and financial assistance have ended, the SAIS will no doubt continue certain operations that have required investments, particularly the pastures and the livestock. These will require technical inputs that the enterprise must obtain directly. In this connection, the project is also helping to bridge the gap between technical and professional personnel and the rural producers, a gap that widened during the first years of the land reform program.

The National Agrarian University has established branches in the Sierra, on the coast, and in the jungle. With the establishment of a farm in Huancavelica, it will be possible to do work in the high Andean grasslands. This would be another way to spread the results of the pasture improvement project, adding a touch of vital green to more of the landscape.



The initial impact of the project — green pasture and irrigation — was "like a gift from heaven."



The little yellow machine

Bob Stanley

In the yard of the Behera Engineering Company near Alexandria stand a score or more sturdy little machines, their bright green and yellow paint adding a dash of colour to the busy scene. Dwarfed though they are by their surroundings, these machines are part of an international exchange of technology that could be the beginning of an agricultural revolution for Egypt's small farmers.

Engineers at the International Rice Research Institute (IRRI) in the Philippines pioneered the concept of "10 horsepower agricultural mechanization" for small-scale rice farmers with considerable success, enabling farmers to increase the number of crops they could produce in a year. Now the idea is being adapted and tested under very different conditions in Egypt by the state-owned Behera Company with the support of an IDRC grant for about one-third of the costs.

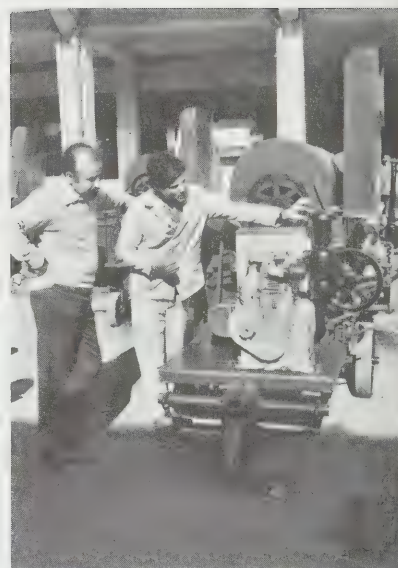
The concept is simple: take a lightweight, reliable 10hp diesel engine, and use it to power a whole family of agricultural implements — threshers, sprayers, drills, planters, pumps — and a basic half-ton utility vehicle. The farmer initially buys the engine with, say a thresher. When the farmer can afford it, additional implements are purchased, perhaps a pump to improve irrigation, or a planter to help get the crops in faster. Each is powered by the one 10hp diesel, which can quickly be transferred from one implement to another.

In Egypt, where most farmers in the fertile irrigated lands of the Nile Valley and the delta already grow two crops a year, the concept is particularly germane. Traveling through the delta from Cairo to Alexandria, it soon becomes plain that the basic sources of power for

agriculture are still the same as they were in the time of the Pharaohs — animals and people. The donkey, the buffalo, and the camel are everywhere to be seen, and in the fields whole families are at work, young and old alike. And therein lies the problem: too often the women, children, and the old are the only help the farmer can get.

Unskilled farm labour is becoming increasingly hard to find in Egypt. There are the demands of the armed forces to answer, and a growing industrial sector tempts young men away from the land with the prospect of regular hours and steady pay. There are also offers of higher wages for labourers in neighbouring oil-rich countries. But perhaps more importantly, universal free education has raised the expectations of Egyptian youth, so that many are no longer content to stay as unskilled labourers on the land.

So there is a demand for mechanization for the small farmer, to make good the shortage of labour and to increase production. Intensive cultivation of crops such as rice, wheat, maize, sorghum, cotton, and many others is possible with year round irrigation and an average of almost ten hours sunshine each day. In fact, agriculture predominates Egypt's economy, earning almost 90 percent of the country's foreign exchange, yet occupying a mere three percent of the total land area. Most small farmers have holdings of only one or two hectares, far too small for conventional mechanization. The use of tractors by cooperatives for a large-scale mechanization program has met with limited success. This is in part because many of the tractors were equipped to perform only one or two operations, but also because tractors are expensive and must be imported.



Engineer Gaber El-Kashab explains the simplicities of 10hp mechanization.

Small-scale mechanization, portable and affordable, could be "the beginning of an agricultural revolution."



The power unit is adaptable to a variety of machines and uses. Here it is tested for irrigation pumping.

Thresher in operation near Tanta, Egypt.



Enter the 10hp mechanization concept. Behera engineer Gaber El-Kashab is obviously proud of his machines. Although they are based on designs used in the Philippines and powered by a German-made diesel engine, they were adapted and built here in Alexandria. He has kept the modified designs as simple as possible, for easy maintenance on the farm. Their construction is tough, to withstand anticipated years of use. And they work, as El-Kashab demonstrates, first with a thresher, then a sprayer, a pump ... until the yard is filled with the sound of the little diesel engines. Fifty have already been built, and another 30 are now in production.

As part of the project, many of these prototypes are being tested in the field. Near the town of Tanta in the heart of the delta, engineer El-Kashab leads the way to a field where wheat is being harvested. Most of the labourers seem to be women and children. And in the midst of all the activity stands one of the little yellow Behera threshers, beside growing piles of grain and straw. The thresher, and others like it, is being evaluated strictly on performance. It will be tested for its harvest yield compared to the more traditional, labour-intensive methods; for the overall quality of the grain it produces; for its cost of operation and maintenance; and for its acceptability to the farmer. The other implements produced by the Behera team are undergoing similar testing all over Egypt under widely varying conditions.

The country has several distinct geographical areas that have different crops, cropping patterns, canal flows, in fact different micro-climates. Around Tanta, for example, the main crops are maize and cotton. Rice is a major crop in the heavy coastal soils, while in the more


arid regions of Upper Egypt, sorghum, grain legumes, and wheat are predominant.

Kamal Gabr is another Behera engineer. He is responsible for planning and quality control on the project, and like Gaber El-Khashab he is very enthusiastic about the 10hp mechanization concept. Certainly, he agrees, there have been "teething troubles" with some of the equipment, but that is to be expected in the development stages, and so far they have been able to keep well on top of the problems. The testing and evaluation on the farms is providing valuable data to help in the development of the machines.

He estimates the cost of the thresher would be about \$us2500, of which about half would be for the diesel engine. The present production line is small, capable of manufacturing about 200 units a year. If there is sufficient demand, however, it could quickly be expanded for mass production, says engineer Gabr. There is even talk of exporting the machines to other countries in the Middle East and Africa.

With its wide variety of crops and growing conditions Egypt is in many ways an ideal proving ground for a low-cost agricultural mechanization system that could be further adapted for use in other countries of the semi-arid regions. One day the little green and yellow machines may be a common sight not only on farms throughout Egypt, but over much of the continent. □

Bob Stanley, Senior Science Writer with IDRC, recently returned from a visit to project sites in Egypt.



“Tree” of plenty — leucaena in the Philippines

Mahmoud Aziz

Ipil ipil is the local name of *Leucaena leucocephala* in the Philippines. A tropical leguminous tree, leucaena originated in Central America and was spread by the Maya and Zapotec civilization throughout lowland Mexico.

With the advent of the Spanish galleon trade to the Philippines from the West Coast of Mexico in 1581, leucaena crossed the Pacific and became a respected and widely naturalized animal browse legume in Southeast Asia. In the 19th Century it became a favoured shade tree for plantations of coffee, cacao, quinine, and rubber. Leucaena was also used as a source of wood for charcoal; its leaves served as a vegetable, and its seed, as food or ornaments. Of all tropical legumes, leucaena probably offers the widest assortment of uses through its many varieties, producing nutritious forage, firewood, timber, and rich organic fertilizer. In addition to its products, growing leucaena has uses revegetating hill slopes and providing windbreaks, firebreaks, and shade.

Of the leucaena genus, grouping 51 different species with more than 100 varieties, *L. leucocephala* is the one that is most exploited and referred to simply as leucaena. It can be classified into three main types:

- The Hawaiian type — short and bushy, grows to 5 metres in height — flowers when very young (4-6 months) and year round. Its yield of wood and foliage is low, and because of its continuous flowering producing many seeds, it spread widely in its native coastal Mexico. Its main value lies in its ability to revegetate tropical hillslopes.

- The Salvador type, a tall tree-like plant that grows to 20 metres, is known as the arboreal type. It often produces more than twice the biomass of the Hawaiian type.

- The Peru type are tall plants, up to 15 metres with extensive branching even low down on the trunk. It produces little trunk but extremely high quantities of foliage used as forage and also as fertilizer.

Large quantities of protein can be

produced efficiently and economically from leucaena grown as forage on well drained fertile soils and harvested regularly. Leucaena forage is highly palatable, digestible, and nutritious for both beef and dairy cattle — with one qualification, discussed below. The plant's drought tolerance and hardiness make it a promising candidate for increasing meat and milk supplies in the dry tropics.

The feedmilling industry in the Philippines uses up to five percent of *ipil ipil* in livestock and poultry feeds. As the total annual output of the 10 leading feedmillers is 600 000 metric tons of mixed feed, the potential requirement for leucaena reaches 30 000 metric tons annually. On the average only 2 percent of *ipil ipil* is added to feeds, however, mainly because it is not available in larger quantities.

Ipil ipil meal contains 20-40 percent protein, and includes a balance of amino acids essential for good nutrition in livestock and poultry.

Used as fertilizer, leucaena helps to enrich soil and aids neighbouring plants because its leaves are rich in nitrogen and other nutrients collected from the deep layers of soil by its long tap root system. Natural leaf drop returns nitrogen and other mineral nutrients to the soil through the action of microorganisms that quickly decay the young leaves, a process called “green manuring.”

The fertilizing value of leucaena is due both to its generous leaf litter and its nitrogen fixing activity. Nitrogen fixing in leucaena, like most legumes, is a result of the mutually beneficial partnership with *Rhizobium* bacteria in the soil. The bacteria penetrate the young leucaena rootlet, and multiply into colonies forming nodules on the root surface. The bacteria absorb large amounts of atmospheric nitrogen and convert it to other nitrogen compounds that the plant can use.

Leucaena also benefits the soil in which it grows by increasing the humus, breaking up compacted surface layers,

improving water absorption, reducing moisture evaporation, reducing soil slippage and erosion, and providing a forest cover to protect the surface against the sun, rain, and wind.

Human action has deforested one-third of South America's native forests, one-half of Africa's, and two-thirds of Southeast Asia's (see *Reports*, Vol. 8 no. 3). If the trees are cut or burned, the roots die and the nutrients that then leach away to deeper soil layers are essentially lost. With nutrients and organic detritus gone, the soil surface cracks, dries in the heat and hardens like cement, or is eroded away by rain and wind.

There is an urgent need in the tropics to protect the remaining forest cover from further damage and to reforest already devastated areas. To replace the vegetation cover, deep-rooted, quick-growing, adaptable trees like leucaena are ideal.

The arboreal leucaena varieties grow rapidly, yielding wood of useful size for lumber and timber. Leucaena wood has the potential to become a major source of pulp and paper, roundwood, and construction material. Leucaena wood makes excellent firewood and charcoal, and has long been used as such in the Philippines. The wood has high density and high calorific or heating value (4.23 to 4.7 calories per gram). As the stumps rapidly regrow after cutting, it is a highly renewable fuel source.

In the Philippines some 15-20 percent of the total land area — about 5 million hectares — consists of grasslands and nonproductive forests. A national goal is to reforest and restore the productivity of this area, beginning with 1.4 million hectares in watershed areas.

The Philippines government has obtained an \$US8.5 million loan from the World Bank to enable farmers to grow *ipil ipil* as leaf feed and for charcoal production. Supported by IDRC, the Philippines Council for Agriculture and Resources Research (PCARR) undertook a project in 1976 to develop the economic potential of leucaena for small landholders.

The most limiting factor in the use of leucaena is that its foliage contains an amino acid — mimosine — that is considered toxic and causes goitre and hair loss in most animals when the intake is too high (see box). Another limiting factor is that seedlings are slow-growing, leaving the tree vulnerable to adverse climatic conditions, weeds, and overgrazing. The tree crop is therefore difficult to establish. But once it is established, leucaena grows prolifically and can even become a nuisance if it is not properly managed.

The PCARR project has progressed, establishing leucaena stands in grass pastures as forage for beef production. It has been found that planting pregerminated leucaena seeds resulted in a larger population stand than the direct seeding of ungerminated seeds. During cultural management experiments, the plants were being cut at different heights every two months, and grown in different population densities. Data on herbage yield showed no significant difference as the density increased, but herbage yields increased as cutting height decreased from 100 cm to 30 cm and 15 cm. Fertilizer trials showed economy: plants fertilized with 50 kg of phosphorus per hectare yielded as much as those fertilized with 100 kg.

A small-scale or backyard forage production scheme for leucaena was established along fence lines, rice paddies, and areas under coconuts, as well as among legumes planted at different sites.

Chemical and biological evaluation of *ipil ipil* herbage as feed were conducted to determine protozoal and total bacterial counts, to measure volatile fatty acids, and measure mimosine degradation in the rumen of the animals and its effects on health, weight gain,

and reproductive performance.

As fertilizer, leucaena leaves — including the leaf stems and smallest twigs — were dried to constant weight, chopped, thoroughly mixed, and incorporated in the soil as an organic fertilizer on rice plantations. Grain yields ranged from 7 to 9 tons per hectare for areas fertilized with leucaena leaves, and 8.4 to 9.8 tons in areas fertilized with ammonium sulfate. Areas without fertilizer yielded 4.5 to 5.5 tons. A fertilizer regime using leucaena leaves on rice crops was developed, and another experiment is in progress to measure the effect of leucaena leaf fertilizer on corn yields.

These experiments will be followed by a study of the economics of leucaena production and its integration into appropriate farming systems using leucaena herbage both as organic fertilizer and as animal feed. This integrated scheme of crop and livestock production should particularly benefit small farmers whose livestock consists of only 2 or 3 head of cattle — typical of 85 percent of all cattle owners in the Philippines.

Leucaena's prime importance to small farmers in the tropics is the economic resource it puts at their disposal. Farmers will be able to use the plant to increase production and ultimately, family income, utilizing only family labour as the major input — without increasing dependence on expensive technologies or products. □

Mahmoud Aziz, a science writer with Al Ahram in Cairo, is presently in Canada on a Pearson Fellowship.



Alone or in combination with other crops — such as coconuts — leucaena offers Filipino farmers a variety of uses as feed, fertilizer, and firewood.

When initially fed on leucaena, cattle make excellent weight gains, but eventually suffer from mimosine toxicity — especially if leucaena is fed exclusively.

Cattle grazed on a leucaena-grass pasture gained rapidly — up to one kg a day — for as much as eight months before showing toxic effects. They would then begin to lose hair around the tail, sometimes completely losing the switch. In severe cases, cattle developed goitre (enlarged thyroid glands), appeared listless and unwilling to move, and salivated profusely. Growth tapered off, and some cattle began to lose weight.

Not much is understood of the action of mimosine. There are clues, however. The mimosine appears to be converted by microorganisms in the first stomach of ruminants into a compound called DHP. This compound is absorbed into the bloodstream, is carried to the thyroid, and there interferes with the production of the thyroxine hormone by preventing the incorporation of iodine. Goitre, hair loss, and appetite depression are among the effects.

Researchers have tried a number of approaches to the problem. As the toxic effects can be reversed by changing livestock to a non-leucaena pasture, a "threshold" diet was developed. Provided stock do not exceed 30 percent leucaena in their diet, they seem to continue to thrive. Experiments have shown that in proper rations leucaena can boost milk production.

A more ambitious approach is trying to develop a leucaena plant with low levels of mimosine. The *L. leucocephala* varieties have all shown disappointingly uniform levels of mimosine, about 3–5 percent of the dry matter. Another species, *L. pulverulenta*, contains much lower levels, but is not vigorous enough to be suitable as a forage. There is also genetic incompatibility that hinders crossing the two species. Researchers at the Commonwealth Scientific and Industrial Research Organization (CSIRO) have had some success in breeding a variety with lowered mimosine.

Given all of leucaena's other attributes, and its future potential as a multi-purpose crop, the mimosine problem will not likely be permitted to hold back this valuable legume.

Rowan Shirkie □

Photo: Neill McKee

No news is not good news

Dennis Schroeder

Just as Canada stands on the brink of a communications revolution, Canadians appear to be turning their gaze inward. Nowhere is the prevailing introspective mood reflected more clearly than in the news media. So concludes Dennis Schroeder, a journalist who carried out a survey of international news coverage in Canadian media. In this article he summarizes the results of the study, which point to the need for better coverage, particularly of events in developing countries, and for alternatives to regular news sources. One such alternative is presented on the next page.

With the aim of creating a "new world information order", some members of Unesco's international commission for the study of communication problems — better known as the MacBride Commission — have proposed a variety of measures to reduce the domination of international news exchanges by the major Western wire services. Meanwhile, alarmed members of the Western news media have rallied behind the freedom of the press banner, attacking proposals for regulations and controls on news reports coming out of the Third World.

A new information order governing the flow of news between rich and poor countries may well be unpalatable for most Canadians, but many of them might miss it when it arrives. An IDRC-supported study of coverage of the Third World in Canadian news media, conducted in 1977 and expanded in 1979, shows that, in general, coverage tends to be scanty. And most of it is very much a part of the "old order".

The initial study concentrated on Canadian newspapers and magazines. Information was gathered through a questionnaire sent to editors of more than 1000 newspapers and other publications, the editorial staff of more than 30 publications was interviewed, and the content of 10 newspapers and periodicals was analyzed.

Replies to the questionnaire showed that although most editors were interested in Third World affairs, they ranked international news coverage as one of the lowest priorities for their publications. Respondents from daily newspapers estimated that international coverage occupied between 10 and 30 percent of total news space. The content analyses of six dailies showed that Third World items occupied between two and eight percent of the average "news hole". The survey also showed that the number of news items related to the Third World was small. In daily newspapers, they ranged from a high average of 10 items an issue down to a low of 3.3 items.

Of the items used, 52 percent were news reports and another 20 percent were news briefs. Backgrounders accounted for 15 percent and general features for about seven percent of all items. Other items, such as editorials, columns, photos, cartoons, and letters, ranged from just more than two percent to less than one percent. All daily newspapers rely primarily on the major Western wire

services — AP, Reuter, UPI — for news stories from other countries.

Thus, on an average day, a typical Canadian daily newspaper might carry about a half-dozen news reports or briefs dealing with the Third World in some way, and it might also have one news backgrounder or general feature.

Both the questionnaires and the content analysis revealed that reports of political and economic affairs, political upheavals, international crimes, and personalities in the news dominate Third World news coverage. Development questions such as population, urban problems, energy, medicine, scientific research, and education get almost no coverage.

Also as part of the study, a comparison was made of international coverage in *Maclean's*, a Canadian news-magazine, before and after its change from a biweekly to a weekly format in 1978. It was found that the "World News" section increased substantially, from 3.7 pages per issue to 6.5 pages per issue, even though the amount of editorial space available remained about the same. Also, the average number of items related to the Third World increased from 1.6 to 3.4 per issue. However, articles tended to become shorter, and there was greater emphasis on people rather than issues or ideas following the changeover.

This past year, a second phase of the media study was carried out. News and public affairs programs on several radio and television networks were monitored and the international coverage was analyzed. In addition, some senior production personnel in the networks were interviewed.

The Canadian Broadcasting Corporation's (CBC) Radio News has a few staff correspondents and a network of freelance contributors around the world. The survey showed that the Third World accounted for 33.3 percent of all stories and 20.7 percent of time on English radio newscasts. On French radio news, the Third World accounted for just over 11 percent of all stories and time. To put all this into perspective, a 30-minute CBC newscast has about the same number, and length, of stories as two or three pages in a daily newspaper.

By far the best in-depth radio coverage of the Third World is on CBC current affairs programs. The two leading programs are "Sunday Morning" and "As It Happens", both of which have worldwide networks of contributors. On "Sunday Morning", an average of nearly half of the three hours is spent on international events and issues outside of Canada and the United States. Close to 38 percent of the time is devoted to the Third World. In addition, "Sunday Morning" has lengthy documentary features on international topics lasting up to an hour. "As It Happens", a daily news program, devoted about 20 percent of its time (90 minutes) and items to the Third World and it provides good back-grounding to the news.

The CBC television news, especially the French network, concentrated more heavily on domestic Canadian news than did radio news. Part of the reason is cost. According to one estimate, it would cost at least \$Cdn150 000 a year to operate a foreign bureau staffed with a correspondent, a cameraman, and possibly a sound man. In Africa, the cost would be much higher.

In the survey, there was a higher percentage of Third World coverage on CTV — Canada's second national network — television news than on CBC. However, like CBC, CTV staff claim that rising costs prevent them from expanding international coverage. Both networks use film from the USA and British television networks quite extensively.

There are other efforts being made by individuals and groups in Canada to provide more information on international affairs — and particularly the Third World — than is normally available in the news media. Also, attempts are being made to upgrade international coverage in the news media.

In the long term, perhaps the best way to improve international coverage is to give future journalists a better grounding in international affairs. The Carleton University School of Journalism — one of two English-language

university level programs in Canada — has been offering courses in international reporting for students in the bachelors, masters, and one-year graduate diploma programs for several years now. Meanwhile, a joint program for international development reporting was set up in 1977 at the University of Western Ontario and Laval University. One aspect of it is an annual conference on an important international subject for professional journalists. At Ryerson Polytechnical Institute, the Third World Centre has established an international development-oriented newspaper, *Connections*, which several journalism students help produce.

Another development-oriented publication is the British-based monthly magazine, the *New Internationalist*. It now has a Canadian on its editorial staff, and there is increased Canadian content and circulation within Canada (see *Reports* Vol. 7 no. 2).

The Development Education Centre, a nonprofit organization in Toronto, produces a weekly radio program dealing with global issues and distributes it to several radio stations. It is also involved in book publishing and film production. An Ottawa development agency, Inter Pares, attempts to put together packages of items from around the world and distributes them to FM radio stations on a commercial basis, but disappointingly few stations have purchased the material.

Five major Canadian churches run an interchurch public information program called "Ten Days for World Development". Its scope has expanded steadily since it was begun in 1973. The Canadian Institute of International Affairs publishes several periodicals on international topics and encourages related research. A relatively new research group specializing in international development issues is the North-South Institute. It has published several reports and is increasing its contacts with the news media and the public.

Many public international development agencies in Canada also have extensive information programs. The Canadian International Development Agency (CIDA) and the IDRC are the two main public agencies. CIDA has a variety of public information programs of its own and also funds nongovernmental groups. The IDRC publishes a wide range of technical reports based on research projects it supports, and it also produces publications and films for a more general audience.

Two of the largest nongovernmental agencies, the Red Cross and UNICEF, this year launched an ambitious \$1.7 million project tied in with the International Year of the Child. The project, which aims to reach every school classroom in Canada, received financial assistance from CIDA and has the blessing of all provincial education departments in Canada. It could be a major breakthrough in introducing more international development education into Canadian schools.

Although many of these organizations are good alternatives, the primary sources of information about what is happening in the world are still the daily newspaper, radio, and television. It would certainly be beneficial for the average reader and viewer if the news media developed closer ties with, and drew on, the resources of these alternative sources that are available in Canada.

The international alternatives to the wire services also need support and encouragement. A Third World news pool linking national news agencies is in the formative stages, and a few Third World-based news services are already in existence. They are unlikely to replace existing news sources, but they could furnish news media in the West with a different perspective to the news.

In the face of major technological changes in the communications industry and the ever-increasing flood of information, the news media have to learn how to do their jobs better. The "global village" is becoming the "wired city", and it could be crucially important for Canadians that the news media do more for the development of a new world information order. □

الصحيفة العلمية

World Paper

Journal Mondial

Diario Mundial

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Mark Gerzon

The idea of a world newspaper came to him "out of the blue" as he was gazing out on the Atlantic Ocean one September morning in 1976, remembers Harry Hollins, founder of *WorldPaper*. Now, three years later, *WorldPaper* is being distributed to more than one million people on five continents. "Still far from the goal," says Harry candidly, "but a good beginning."

Harry wants *WorldPaper* to be a "global community newspaper" in which the voices of the world can speak for themselves and be heard worldwide. Publisher Crocker Snow and I, who have worked with Harry from the beginning, are committed to this same goal.

WorldPaper is unique in that its eleven Associate Editors, in all corners of the world, are outstanding journalists who report from their regions. They are not correspondents or stringers who have been parachuted into a specific location to cover newsworthy events. They are experienced resident journalists who have witnessed and participated in the struggles and achievements of their countries — the processes of development. They do not write the homogenized prose of the multinational news magazines. Their writing is marked by the clear and unmistakable authenticity of their own cultures.

In addition to writing for *WorldPaper*, these editors assign stories within their regions, contribute to the "Global Editorial" page, and select the major topics to be covered. Through constant correspondence as well as regular meetings, they work with those of us at the Boston headquarters to make *WorldPaper* a forum for unbiased discussion of international issues.

The journalists have been attracted to *WorldPaper* because in it their work can appear alongside that of writers from any other nation. Their ideas will not be screened or rejected because of any single nation's political or cultural biases. In particular, Third World journalists are offered an opportunity to be read in the developed world, not by a small select group of scholars or foreign policy specialists, but by millions of regular newspaper subscribers. We hope this will help to reverse the one-way, North-South flow of news. Finally, we offer journalists everywhere a professional challenge: to write on subjects of global relevance for a worldwide audience.

WorldPaper's readership is also international. With the cooperation of innovative and farsighted metropolitan newspapers on five continents — including, very recently, one Canadian daily — we have devised a decentralized and efficient distribution method. In these papers we appear as a bimonthly magazine supplement. More than 1.5 million readers thus

have access to *WorldPaper* through home delivery or newstands.

No one, including our editors and our readers, is foolish enough to believe that we have found a magic formula for a world paper. "We haven't reached our goal yet by any means," one of our Associate Editors said recently, "But it is such a difficult goal that we must be patient." In a "Letter to the Editor" published in our second issue, a reader from Australia agreed: "*WorldPaper* is a major and welcome step forward," he wrote. "Nothing is easier than to knock it and its self-evident imperfections and present limitations. But it is there, where a few years ago the very idea of such an enterprise would have been utopian."

To make this contribution to world journalism last, progress is still needed on four major fronts.

First are investors: we want *WorldPaper* to be owned by individual investors from as many regions of the world as possible. This will ensure that our stockholders and board of directors represent a variety of global constituencies and strengthen the paper's independence.

Second, we want to find many more newspapers around the world that recognize the need to broaden their global news coverage. We intend to increase our readership in the continents where we already appear, and are now extending into Europe and the Middle East. *WorldPaper* provides the complete page negatives to host newspapers, which print the supplement at their own expense and insert and distribute it. There is no exchange of currency.

Our revenue comes from the sale of advertising — our third need. Both multinational corporations and international organizations are finding our pages to be especially useful for reaching a global audience. The *WorldPaper* staff generates corporate advertising and global classified ads. A host paper can replace several designated editorial pages with locally generated ads and keep that revenue to help defray its own production costs.

Finally, we believe that ultimately, our readers will write *WorldPaper*. We seek out and encourage reports, photographs, experiences, etc., from non-professional writers. Short articles are particularly welcome as is any information our readers feel to be particularly newsworthy and deserving of greater global attention. We encourage criticism and suggestions for future articles from anyone concerned about global issues.

For years people throughout the world have recognized that we can no longer afford to have issues of global significance defined and debated in news media dominated by single nations or regions. Both North and South, journalists are trying to develop new structures to make the currents in the global news flow represent genuinely the diversity and richness of world opinion. In this spirit, *WorldPaper* was conceived. □



Winding along the road from the relative coolness of Guatemala city to the hot, humid Pacific lowlands, Dr Fernando Viteri, Chief of the Human Biology and Nutrition Division in the Institute of Nutrition for Central America and Panama (INCAP), explains a basic fact of rural life in Guatemala: "Just as children may have their own dog, their own cat, they may also have their own shigella, their own salmonella."

Studies have shown, in fact, that 96 percent of rural people in Guatemala harbour one or more species of parasitic worms or protozoa, or both. Even a high percentage of apparently healthy children have been found to be infected with shigella or salmonella organisms (see *Reports* Vol. 8 no. 1).

This continuous contamination of the gastrointestinal tract is a major health problem in Guatemala, as it is in many other developing countries. And a major agent in this contamination is the home environment itself.

Living conditions in rural areas are precarious in more than economic terms: water supplies and sanitary facilities are inadequate, and sanitation practices are poor or nonexistent. These favour the perpetuation of a highly contaminated environment, reflected in the persistence of intestinal parasitism and chronic intestinal infections. Dr Viteri puts it more simply: "In a highly contaminated home, people have contaminated guts."

Starting from the hypothesis that the home was an extensively contaminated environment, and that mothers played a key role as "spreading agents" of contamination, INCAP researchers, with IDRC support, began a project in 1977 to evaluate and pinpoint within-the-home contamination, the magnitude of the problem, and to design a sanitary education program to combat it.

Two villages about an hour's drive from Guatemala City were chosen for the study. Las Chapernas and Florida Aceituno are typical of communities in the Pacific lowlands. Both were founded about 20 years ago on the sites of

Making health a household word

Michelle Hibler



Photos: Jaime Rojas



Children in Guatemala. A high percentage of apparently healthy children have continuous gastrointestinal infections. Health education may break the vicious cycle.

former large *fincas* (ranches) owned by the government. Through land reforms, small plots have been distributed to farmers and communities established. There are no water supply services or electricity in the villages. Sanitary and garbage disposal services are practically nonexistent. Most of the houses are made of corn stalks or cane, with thatched or corrugated tin roofs and dirt floors. Animals — dogs, chickens, and pigs — roam freely in the yards and the houses.

The first phase of the study aimed at developing and standardizing methods to measure the contamination of the environment, particularly of the home environment, and to measure changes that occurred in the ecology of the gastrointestinal tract of the population. Through extensive surveys it was found, for example, that 92 percent of family members do not wash their hands after defecating, and the same percentage of mothers do not wash after changing the baby's soiled diapers. Older children who assist mothers in caring for their siblings also lack proper hygienic practices. The use of latrines — even by people who have them — is not common.

Most villagers obtain their water from wells that are usually left uncovered, inviting pollution. The tin cans used for drawing water are frequently left lying on the ground. Inside the home, water is stored in open containers, often on the floor in reach of the animals. Tests showed a high degree of water contamination, although the villagers believe the water to be clean because they cannot see the bacteria.

To determine the presence of bacteria and parasites in the intestines of the villagers and to measure the degree of food malabsorption, simple noninvasive tests were developed for use in the field. All that is basically required is to measure the amount of hydrogen in the breath. Healthy individuals rapidly absorb carbohydrates. Only a small part of these substances is not absorbed and reaches the colon where bacterial metabolism takes place, producing hydro-

gen. The gas permeates the intestinal walls and reaches the lungs where it is exhaled. Elevated concentrations of hydrogen in the breath thus mean either under-absorption of carbohydrates, or increased bacterial overgrowth in the small intestines.

But because this test cannot distinguish between food malabsorption and bacterial overgrowth, another test standardized at INCAP is used to determine the cause of hydrogen production. A sugar, D-xylose, which is normally absorbed but not metabolized, is administered. In persons with gastrointestinal disturbances, a portion of the sugar is unabsorbed and is metabolized by bacteria, producing hydrogen. Thus, a rapid and elevated concentration of hydrogen in the breath after eating the sugar indicates the presence of bacteria.

Although these tests are not developed to the stage where they are fully accurate predictions of the contamination level of the home environment and of the alteration in the gastrointestinal ecology, preliminary results are promising. Techniques were also developed to easily measure the bacterial contamination of hands, food, and water.

In order to evaluate the problems associated with diarrhea, it was important to understand the local beliefs about the disease. Most rural Guatemalans do not in fact consider diarrhea to be a disease, but rather a symptom of a wide range of disorders. "They are still in the pre-Pasteurian age", says Dr Viteri. "They don't recognize the existence of bacteria."

The causes given for diarrhea range from eating too fast or too much, to falling and displacing an unspecified organ, to the "evil eye". "Worm disturbances" are also commonly cited. Worms are believed to be normal and necessary hosts in the body. Occasionally, however, they leave the special bag in which they live and roam about the body causing fever, vomiting, stomach upsets, diarrhea, etc. Treatments are intended to return the worms to their bag, or to eliminate the offending

wanderers. On no account can any treatment claim to rid the body of worms completely because the villagers believe death would follow.

From this and other information gathered it was possible to design a sanitary education program aimed at breaking the cycle of contamination, using concepts that are in accord with the traditional belief system.

In the second phase of the project, now underway, the education program is being implemented in an experimental community, Florida Aceituno. The community's reception to the study was unanimous and enthusiastic.

To ensure the program's acceptance and continuation, the support and participation of the villagers had to be assured. Community leaders have therefore been involved from the beginning to act as agents of change and health educators. Traditional healers and midwives are also called on to participate, and women from the village have been selected to act as rural health volunteers, responsible for visiting families twice weekly to record cases of diarrhea and report them to the INCAP fieldworker.

The production and evaluation of the educational materials began early this past summer. The main materials to be used are cassette forums and motivational games. These are being developed and pretested in another community before their introduction to Florida Aceituno. Five main topics will be dealt with: water handling, child care, pregnancy and lactation, food handling, and the home environment.

The materials are also being developed with the community's collaboration. During the first phase of the project, for example, a set of posters and brochures had been designed to help in determining the villagers' concepts of cleanliness and to illustrate the right and wrong way of doing things. The first posters were rejected by the villagers who failed to recognize themselves in the illustrations. "They say 'That's not us because the woman's braids are too long,' or 'Our children don't wear that type of shoes' ", explains Dr Viteri.

A new series, drawn by Mr de Leon, a sanitary engineer working with the INCAP project, has gained wide acceptance. So much so in fact that in some houses pictures from the brochure on the use of water have been pasted on the walls for the children to follow. The main character in the brochure on building latrines is so true to life that a real counterpart, of the same name and strong physical resemblance, was found in the village. He also built himself a latrine.

The materials are examples of the type of message the program wants to bring. Thus they come in pairs: whereas one shows a woman's dirty hands making tortillas, the other illustrates clean hands with well-trimmed finger-

nails and much cleaner tortillas. Others depict clean and dirty yards, children and infants, wells and water storage.

The materials and the program are centred on the mother because of her central role in the home and as an agent in the cycle of contamination. Women's groups are being organized to give them an opportunity to discuss their problems and needs freely, and to provide them with a supportive environment for their action. But because of the dominant place of men in Guatemala's rural society, their assistance and support has also been enlisted. Through community organizations they are being called on to build latrines, install curbstones around wells, build well covers, etc. In fact, these groups have a direct role in program planning, and the INCAP team, which includes two health educators, assists, advises, and facilitates activities in response to the community's needs.

The effectiveness of the health education program will be assessed throughout the year of experimentation using the tests developed during the first phase of the project. A team made up of an auxiliary nurse and three surveyors are conducting weekly surveys of diarrhea episodes and their causes, and are measuring the bacterial contamination of water, hands, and stored food. Changes in behaviour are also being recorded.

The team members have been rigorously trained in community work. According to Dr Viteri, they are crucial to the program "because if they don't do the job right, they can ruin the whole project. We're walking on eggshells," he says. "This type of study demands a lot from a community. Every week someone comes around and asks the same questions. It might be fun for the first weeks, but not after 52 weeks."

He also makes it clear that "we never fool people." The community has been told that it is a study, that the information is confidential, and that they may not get anything out of it. "We don't offer anything that we cannot bring to fruition", he says.

During the course of this year it is hoped that a correlation will be shown between the education program and home contamination, attested to by the hydrogen count. And although the program may well bring real benefits to the villagers, it may also illustrate the validity of the tests that have been developed. If so, simple, effective methods that can be applied to many people will have been perfected, contributing substantially to the evaluation of health-oriented actions everywhere.

"I am confident — very confident — that this study will bring very interesting results", says Dr Viteri. "Even if the results are negative, the study will bring new technologies, new ideas, new hypotheses for further work." □

BRIEFS

THE ARTISANS' MOVEMENT TAKES HOLD

Artisan crafts, such as basket making and weaving, are often little more than a meagre supplement to the borderline incomes of rural people in developing countries. Nevertheless, in some countries handicrafts have the potential to become much more than a cottage industry.

In Bolivia, some 600 000 people are involved in artisan industry, making a contribution of about 30 percent to the gross domestic product. An even greater potential is yet to be realized, because until recently, the artisans have lacked the organizational support and resources necessary to control their enterprise. Usually farmers first and artisans second, these people are at the mercy of entrepreneurs who buy cheaply and sell dearly. In addition, many rural artisans lack the technical experience needed to produce the quality of product required for export or commercial trading.

An experimental program begun by the Bolivian government on the high plains or altiplano area 90 kilometres from the capital of La Paz, about 4250 metres above sea level on the shores of Lake Titicaca, may be changing that. In 1973, with support from the Inter-American Development Bank, the *Instituto Boliviano de Pequeña Industria y Artesanía* (Bolivian Institute for Small Industry and Handicrafts) established a network of nine production co-operatives in the area, where peasant families have for generations woven colourful, warm woolen products — ponchos, sweaters, gloves, tapestries, and rugs. The cold, thin air of the region makes such products a necessity: the weavers' skill at expressing altiplano culture in traditional designs makes them beautiful.

The cooperative program began generating business in its first year, and increased every year after. Overall, export of artisan products from Bolivia increased

an average of 50 percent in the three years from 1973-1976. A second phase of the program, begun last spring, will move into more sophisticated areas of design, finishing, and commercialization.

Members of the Lake Titicaca area cooperative have built a community building to be equipped for use as an office and work facility. A measure of prosperity has come to some families. The peasants of the altiplano are not abandoning farming for art — food must remain the first priority — but the artisans' cooperative movement seems to be taking hold.

MASS MURDERER PRONOUNCED DEAD!

Smallpox, the 6000-year old mass murderer, has been eradicated throughout the world, as announced at a World Health Organization (WHO) conference in Nairobi last fall. The last person to have endemic smallpox was a Somali in 1977.

WHO offered a reward of \$US1000 to the first person to report a confirmed case of the disease. The reward has not been claimed in the last two years. However, WHO's Director-General, Dr Halfdan Mahler, cautiously referred to the effective elimination of the disease as "an interruption of the endemic transmission of smallpox."

Smallpox viruses are still kept for research in seven laboratories in United States, Russia, Britain, China, Holland, and South Africa. An emergency reserve of 200 million doses of vaccine is being kept in Geneva and New Delhi. Dr Mahler says that vaccinations still carried out in many countries are no longer justified: "Risks outweigh any possible benefits in a world free of smallpox." When smallpox vaccination programs cease, the world will save \$1 billion a year.

TEN DAYS FOR DEVELOPMENT

"If food is a basic human right because life cannot be sustained without it, then work in the sense

of making a living in order to be able to eat, is obviously a closely related right." So Robert Gardner, National Coordinator for the Ten Days for World Development 1980, sets the theme of the development education program sponsored by five national Canadian Christian churches (Anglican, Catholic, Lutheran, Presbyterian, and United).

The program is aimed at both church supporters and the general public, and is designed to "enable Canadians at the local level to identify global social, economic, and political issues, to see them within the context of their own lives, and to acquire skills through action to bring about change for more creative human development."

The emphasis of the campaign, focused on the work issue as "making a living", will fall on the ten days between February 1st and 10th.

For further information contacts may be made through churches or local committees set up in communities across Canada, or through the Ten Days' Coordinating Office, 600 Jarvis Street, Room 219, Toronto, Ontario M4Y 2J6.

FARMING TAKES TO THE AIR

A radio program aimed at educating farmers on how to increase food production, and helping them overcome weather and weed threats has been a tremendous success in India.

"Farm school on the air" is credited with increasing food production by 50 percent in Karnataka and Tamil Nadu states. And, when a cyclone hit in a district of the Punjab — India's "breadbasket" — the program provided special advice on planting short-duration wheat that helped tide farmers over the storm devastation.

Farm radio officers working for the Farm and Home Broadcasting Service of All India Radio have developed more than 200 16-week courses. Programs advise the farmers on techniques such as the use of pesticides and fertilizers, crop rotation, marketing, soil condition, and weather.

Farm School on the Air reaches about 80 percent of the country, broadcasting through 48 stations and in a number of dialects. The network is expected to expand to 60 stations by the end of the year, and plans are being made to offer programing on dairy production and nutrition.

The farm school registers its listeners, and the government

offers incentive prizes to listeners who boost farm production exceptionally well. Most lessons are taped for reuse — a practice found to be effective in benefiting illiterate farmers — and will be transcribed and produced in booklet form. A bank has agreed to supply transistor radios to farmers and dairymen as a contribution to the program.

The program has made its mark outside India as well, generating interest on the part of UNDP and Unesco. The two agencies cosponsored a workshop with the Asia Pacific Institute for Broadcasting Development that brought together representatives from 13 countries in the region to learn from the Indian experience — and to exploit the potential of radio in development programs in agriculture, health, and other fields.

HUNGRY DUCKLINGS EAT HOPPERS

When scientists at the International Rice Research Institute (IRRI) found that many insecticides actually increased the reproduction rate of brown planthoppers, a major menace to Asia's rice crop, they realized they would have to find another way to control the pests. So far one of their most effective weapons has been the duck.

In one test the IRRI researchers released 25 adult ducks into a 100-square metre rice plot. The birds went to work so effectively that they reduced the hopper count by 86 percent. And in another similar test 50 hungry ducklings proved even more voracious, snapping up 90 percent of the hoppers in just four hours.

Conclude the IRRI researchers: It should be possible to use ducks in a pest management system, even though they eat some beneficial insects in the rice fields. Next, a project to train ducks to be more selective in their eating habits?

MALARIA VACCINE WITH A HEART

A researcher at the London School of Hygiene and Tropical Medicine is developing what he calls an "altruistic" vaccine, one that will prevent the transmission of malaria without necessarily protecting the vaccinated individual.

The vaccine is one of a number of advances made possible by the recent breakthrough that permits *plasmodia*, the parasites which cause malaria, to be grown outside the host human body.

Dr Geoffrey Targett based his approach on the last stage of the parasite's life cycle, the sexual stage, in which parasites form reproductive bodies called gametocytes that fuse or "mate" in the mosquito carrier. Mosquitos acquire and transmit the gametocytes as they suck blood, thus spreading the disease. In building up the body's immune defenses against gametocytes, Dr Targett's vaccine blocks the spread of malaria at a critical point in the parasite's life cycle.

The vaccine has been tested on mice. Mosquitos were allowed to feed on mice that had first been vaccinated with Dr Targett's vaccine, then infected with malaria. Subsequent examinations showed that no parasites developed in the mosquitos.

Meanwhile, a colleague, Dr Sydney Cohen of Guy's Hospital in London, has been developing a more orthodox vaccine based on an earlier stage of the parasite's life cycle. If the two approaches were combined in a single "shot" individuals could be protected and transmission prevented.

REGIONAL DIRECTOR APPOINTED IN DAKAR

The new Director appointed to IDRC's West Africa Regional Office in Dakar, Senegal, is Mr Kamanda Lumpungu, of Zaire. Mr Lumpungu took on his duties on October 14, 1979.

A graduate of economic sciences — Université Lovanium (Léopoldville) and Université de Rennes (France) — Mr Lumpungu has occupied various senior positions in his own country, and has been recently appointed Dean of the Faculty of Economic Sciences of the Université Nationale du Zaïre (UNAZA). A teacher at the Faculty of Economic Sciences of IRES (Institut de Recherches Economiques et Sociales) since 1971, he is also its Scientific Council president and, since 1976, the Executive Secretary of the Conference of Deans of the Université nationale du Zaïre. He is also a member of the Standing Committee of Studies of the UNAZA Scientific Research Council.

A member of various African and international agricultural economics societies, Mr Lumpungu has also written several books on the subject of agricultural development in Zaire.

Development on a human scale

William Ellis

One of the major concerns of the agencies participating in the Forum of the Non-Governmental Organizations (NGOs) at UNCSTD was how they might reorganize themselves to become more effective participants in world governance.

Based on the discussions at UNCSTD, William Ellis, Executive Secretary of TRANET (Transnational Network for Appropriate/Alternative Technologies) here initiates the dialogue on how NGOs can develop their potential for action.

Nation-states have governed world affairs for only a very brief period of human history. These autonomous governmental bodies have divided the earth into a chessboard with little concern for cultures, languages, religions, races, or ecologies. Both within and between these artificial boundaries, games of politics are played with the resources and the lives of people. It is time to ask to what extent this world governmental system must be changed if we are to reach the full potential of human development.

The United Nations came into being to write the rules and to referee the competition among nation-states. It assumes that the nation-state system is the best and accepts as a basic tenet that each should retain unchallenged control over the resources and the lives within its boundaries. Its purpose is to resolve conflicts among its members and to produce a stable balance of power. To do so, it must operate in a manner more sensitive to international tensions than to the problems of global or human development or their potential.

A growing number of people have different concerns based on other premises. Some see the world's environment as our first order of business, others put primacy on unmet human needs, some with individual human rights, and still others with the exhaustion of natural resources. Few, in fact, list the preservation of the nation-state as a priority. Many of us now see the dawning of a "new age" in which the priority will be people rather than power, an age in

which our institutions and activities will be by the people, involving everyone in the design, development, ownership, and control of programs, products, and processes. These institutions will also make use of local materials and local skills to solve local problems and develop local potentials, to integrate culture, economy, spirituality, ecology, and technology in design criteria, and have as their goals long-range sustainability, environmental protection, and the welfare of human generations rather than short-term profit or power.

This "new age" demands that all of our institutions be re-examined and changed or supplemented. This analysis should reach — and in fact is already reaching — into our homes, our hearts, our industrial organizations, our universities, our professions, our communities, and our governments. One major concern must be the global governmental system. Can it meet the criteria of becoming by the people, location specific, holistic, and future-oriented?

"New age" rhetoric is already quite evident in many UN and international documents, coming from both developed and developing countries. The World Bank's program to aid the poorest of the poor, the International Labour Office's interest in labour intensive technologies, UNIDO's promotion of small-scale industries, and Unesco's developments in nonformal education are cases in point. Existing agencies have clearly recognized that past strategies based on modernization, industrialization, technology transfer and "trickle down" have failed. Alternative development strategies based on meeting basic human needs, collective self-reliance, interdependence and other alternative development concepts have become the accepted conventional wisdom.

In spite of this general acceptance of the principle that people themselves must be involved in locally oriented development programs, and in spite of the sincere efforts being made within the existing international framework to carry out such programs, there is a growing awareness that the UN and nation-state system is not adequate for the task. A recent paper from the government of the Federal Republic of Germany concludes, for

example, that "basic need projects are best suited for non-governmental aid organizations ... which have the necessary grassroots contacts in partner countries." Similarly, an analysis of the USA's Agency for International Development (AID) and of World Bank support programs carried out by the Institute for Food and Development Policies concludes that: "Such (basic needs) aid should go to indigenous groups already based in village realities."

Such conclusions are a direct challenge to the nongovernmental agencies. The excellent work of the private voluntary organizations (PVOs) is now being recognized, but can it be expanded to have a major impact on the problems of world hunger, population, pollution, health, education, and housing? Can they better supplement, complement, or replace the UN/nation-state system in its important work on human development and world peace?

The "new age" recognizes that the people are not the problem, they are the solution. Transnational people-to-people networks can overcome the limitations of the UN/nation-state system. They can replace the conflict mode of operation with a collaborative mode in which people help people to become self-reliant. By honouring and recognizing one another's traditional cultures and technologies they may revive human dignity and promote human well-being. They may replace the international concern with GNP and trade balances with concern for human well-being and unity among people.

Such networks may complement the UN system in yet another way. The Pugwash Conferences — transnational meetings of scientists — were instrumental in overcoming the East-West tensions of the "Cold War", for example. Transnational people-to-people networks could act as a "People's Pugwash", not only defusing tensions between nation-states, the have and the have-not nations, but also easing the tensions between the elites of the world and the disenfranchised.

People in all parts of the world are recognizing that big business, big government, big technology, and other centralized organizations cannot alone solve local problems or develop local potentials. Only the affected people themselves can. And people in all parts of the world are recognizing that small is not only beautiful, but also that it is possible and it is happening. There is a worldwide revival of concern about human rights, human dignity, and individual initiative. The UN may still make important advances in stabilizing inter-nation relations, but this decade may be hailed as the beginning of the future because people themselves will have initiated a more creative approach to world welfare — a complementary alternative to the UN — a second level of world government. □



Photos: Neill McKee

Oyster farming in the tropics

Oysters are not a luxury food in many areas of the tropics. Gathered wild by rural people in coastal areas, they are a source of much-needed protein. However, if oysters are farmed — cultivated instead of simply gathered — their potential can be greatly increased both as a source of food and income.

Oysters are well-suited for "domestication." Because they are sedentary eaters that filter their food from the surrounding water they require no cages or enclosures. Their nutritional requirements are simple. They can be stocked at fairly high densities, with no apparent loss of growth. Harvesting is easy. The meat of the oyster is high in protein, and prized for its flavour, cooking and eating characteristics.

Oyster farming in the tropics is a 29-minute colour film by Neill McKee on two IDRC-supported oysterculture research projects underway in Sabah, Malaysia, and Sierra Leone, West Africa. The film covers most of the essential features of oyster production — ranging from the traditional harvesting of wild oysters from canoes in the mangrove swamps of Sierra Leone to the intensive, semi-mechanized oyster industry in Japan. Along the way, the biology of the oyster is explained, and the various stages of the culture process are described. Different culture systems are demonstrated, illustrating how farming techniques can be adapted to suit local conditions and resources. Some of the problems that may affect culture operations, such as pollution and competition from fishing, are also presented.

Both entertaining and informative, *Oyster farming in the tropics* lends itself well to use in the classroom and to educational or science programming on television. It should also be a valuable tool for briefing decision-makers and researchers on the potential for oysterculture in tropical regions. For information on loans, contact the Audiovisual Unit, Communications Division, IDRC, PO Box 8500, Ottawa, Canada K1G 3H9. A postage and handling fee of \$Cdn10 is requested in North America and Europe.

Rowan Shirkie □



Photo: Frank Green



Photo: Frank Green



New dimension in publishing

One of the unique features of the International Development Research Centre lies in the fact that its mandate empowers it to fund, wherever possible, local people and institutions in developing countries to carry out research. Recently this was taken one step further when the Centre signed a tripartite agreement with the Institute of Social and Economic Research (ISER), University of the West Indies, and Heinemann Educational Books (Caribbean) Ltd. to publish five reports resulting from a Centre-supported project.

The project had been for the Institute of Development Studies, University of Guyana, Georgetown, and the Institute of Social and Economic Research, University of the West Indies, Kingston, Jamaica, to study the methods by which technology has been transferred to the Commonwealth Caribbean, to assess its effects, and to suggest ways of increasing economic and social benefits. Phase I of the project has just been completed and has resulted in five major reports as well as seven supplementary ones.

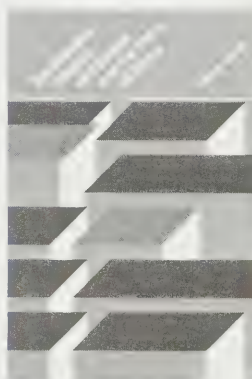
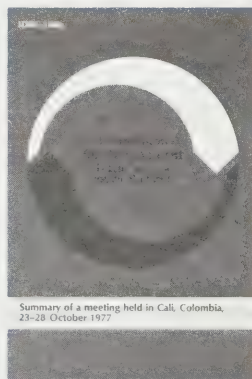
The agreement grants funds to Heinemann toward the costs of using local editors for the books and to contract the typesetting, graphic design, and printing to local Jamaican firms — thereby keeping the books uniquely "Caribbean".

The reports, which are expected to be published by early 1981, include studies on secondary agro-based industries in Barbados; petrochemicals, including technological aspects of the bauxite industry in the Caribbean, and the technology and the manufacturing sector in Trinidad and Tobago; commercialization of technology and defence in the Caribbean; agriculture, including environmental consequences of the industrialization of the Commonwealth Caribbean with particular reference to Trinidad and Tobago; and a general study on technology policies for the Caribbean.

The funds for this grant were from Phase I of the project, sponsored by the Social Sciences Division of the Centre, and will be administered by the Communications Division.

Marilyn Campbell □

New publications



Earthquake history of Ethiopia and the Horn of Africa, Pierre Gouin. Published in November 1979, 258 pages, IDRC-118e.

An annotated and edited version of part of the author's data file on seismic and volcanic activity in northeastern Africa, this monograph is a companion volume to *Seismic Zoning in Ethiopia* published by the Geophysical Observatory, University of Addis Ababa. It gives the primary and secondary sources as well as the interpretation on which the statistical analyses of regional seismic and volcanic hazards in the earlier volume were based: many maps and figures are included.

Information for development in Latin America and the Caribbean: summary of a meeting held in Cali, Colombia, 23-28 October 1977. Published in December 1979, 28 pages, IDRC-128e.

This publication is the summary of a meeting sponsored jointly by IDRC, the United Nations Economic Commission for Latin America (ECLA), and the Inter-American Development Bank (IDB) on information for development and problems related to the implementation of national information systems in Latin America and the Caribbean. The summary provides a brief description of global, regional, and national information systems in various development sectors; gives an account of users' needs from the point of view of planning, financing, and implementation; and reports the specific and general recommendations on how to improve and expand services. A bibliography and list of participants is included.

Standardization of analytical methodology for feeds: proceedings of a workshop held in Ottawa, Canada, 12-14 March 1979, W.J. Pigden, C.C. Balch, and Michael Graham, editors. Published in December 1979, 128 pages, IDRC-134e.

The proceedings of a workshop jointly sponsored by IDRC and the International Union of Nutritional Sciences, this publication focuses on the methodology for predicting the digestible energy value of feedstuffs, the measurement of energy intake, and the definition of the most suitable expression of energy values. The 14 papers, together with a summary and recommendations, attempt to put forward guidelines intended to help practical analysts.

Traditional medicine in Zaire: present and potential contribution to the health services, revised and abridged by Rashim Ahluwalia and Bernard Méchin. Published in December 1979, 40 pages, IDRC-137e.

Originally published in French, this monograph, which summarizes a technical report on an IDRC-supported project, mirrors the double orientation given the research: a true picture of traditional medicine and a descrip-

tion of the actual situation on the one hand, and suggestions for the reorientation of health policies dealing with healers on the other. It contains concrete data on healers and their patients, looks at their treatments as a medical system, and describes the evolution of traditional medicine in Zaire. It recommends that "modern" and traditional medical systems be integrated in a new health system that would be truly African.

Canada's role in science and technology for development: proceedings of a symposium held at the Ontario Science Centre, Toronto, Canada, 10-13 May 1979, J. King Gordon, editor. Published in November 1979, 136 pages, IDRC-141e.

This publication is an account of a symposium held as part of the preparations for the United Nations Conference on Science and Technology for Development (UNCSTD), at which Canada's role — past, present, and future — in international cooperation on scientific and technological development was reviewed. Discussion includes issues of technology transfer, the relevance of science policy, and the mechanisms in Canada and elsewhere used or needed to enlist science and technology for development. A list of participants is included.

Food or famine: an account of the crop science program supported by the International Development Research Centre, A.D.R. Ker. Published in November 1979, 79 pages, IDRC-143e.

This publication describes the crop science program of IDRC, which supports research to increase the production and improve the quality of the indigenous food crops of developing countries. The publication gives an account of the more than 100 crop science projects supported worldwide in five main networks: sorghum and millets; triticale; food legumes and oilseeds; root crops; and cropping systems. The names and addresses of project leaders are given for further inquiry.

SALUS: low-cost rural health care and health manpower training — an annotated bibliography with special emphasis on developing countries, volume 5, Rosanna M. Bechtel, editor. Published in December 1979, 186 pages, IDRC-144e.

This is the fifth volume of a series of bibliographies that compiles and coordinates information, both published and unpublished, on nontraditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and utilization of health workers.

Food systems: an account of the post-production systems program supported by the International Development Research Centre, R.S. Forrest, W. Ed-

wardson, S. Vogel, and G. Yaciuk, Published in November 1979, 72 pages, IDRC-146e.

This publication describes the post-production systems program of IDRC, which supports research at all stages of the food system, from harvesting to consumption. An overview of the program is given, discussing harvesting, threshing, drying, storage, primary processing, transportation, food processing, marketing, and utilization of food crops: 51 projects are detailed, and a bibliography of related IDRC books and films given.

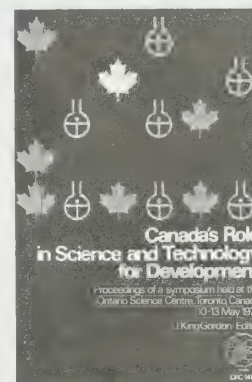
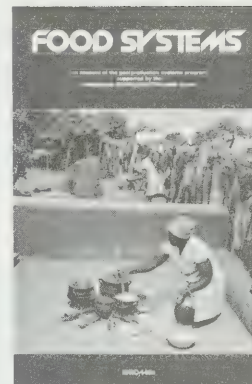
Rural health care in Egypt, Nawal El Messiri Nadim. Published in December 1979, 40 pages, IDRC-TS18e.

Based on information gathered in an IDRC-supported research project of the International Islamic Centre for Population Studies and Research, this study describes and analyzes the content and structure of formal and informal health services in rural Egypt and the interrelationships between the two systems. The study examines the occupational qualifications of traditional health workers — particularly midwives, or *dayas* — and presents modern medical personnel and health facilities as well as the attitudes of village populations toward illness and treatment.

The theory and practice of induced breeding of fish, Brian J. Harvey and William S. Hoar. Published in November 1979, 48 pages, IDRC-TS21e.

A review of the practical application of the technique of induced breeding of fish through hormonal manipulation, this publication summarizes and discusses recent advances in the knowledge of the reproductive physiology of fishes that affect the ability to spawn cultured species in captivity. It also extracts from current literature the practical details and methods of induced breeding, and presents theoretical knowledge.

For information on these and other IDRC publications, please see announcement on back cover of this issue.



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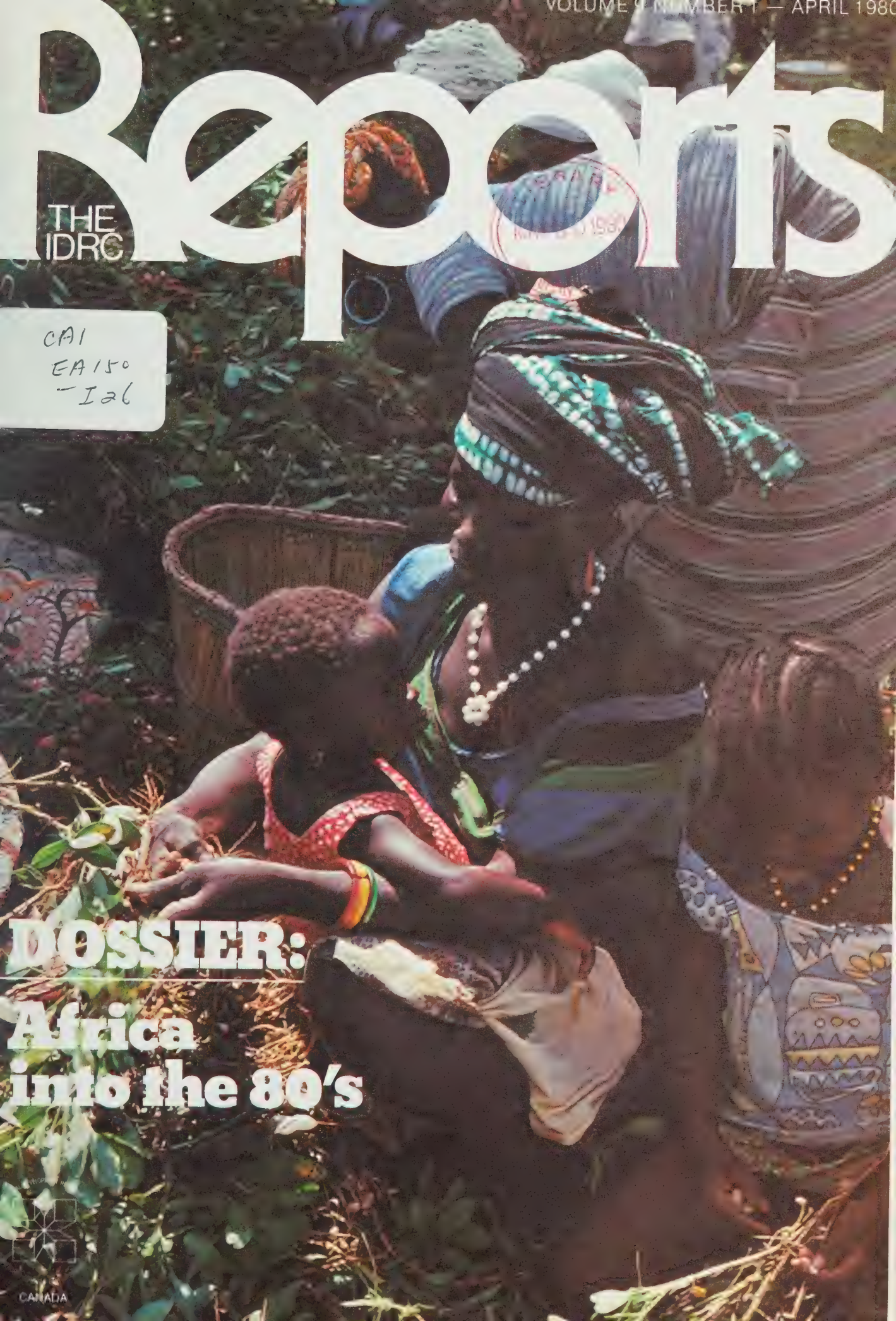
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In addition to *IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related activities. A catalogue of currently available material is available on request.

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Africa
into the 80's



CANADA

Breaking the barriers

Cyrus Eaton did everyone a favour some years ago when he set up the Pugwash conferences, enabling us and Soviet scientists to recognize a common interest in cooperation and peace. These individuals sat with each other not as functionaries of opposing states but as men of goodwill dedicated to similar pursuits while living in different countries.

As William Ellis suggests (Commentary, December 1979), such meetings can go far to dissolve the mistrust and misconceptions fostered by the nation-state system. Direct encounters between individuals facing each other as human beings desirous of learning, willing to listen, and shunning prejudice, can be enriching experiences which cut through the barriers of propaganda and politics. The sense of human relatedness which results shows the potential for transnational solidarity.

Similarly, the reported proliferation of groups building links around international development concerns is a heartening trend. The more exchanges, information sharing, joint projects, and actions that there are, the more we will realize just how similar our needs and basic interests are, the more obstructive the political barriers will seem. We in the developed countries may also learn that we do not have the last word on everything — on anything in fact.

Industrial civilization has reached an historic crossroads. We are witnessing a turnabout in the global scheme of things. Acceptance of this will require widespread attitude changes in the developed countries,

changes that can be fostered by the existence of grassroots movements with global outlooks. The climate for creative adjustments in the West is far from propitious; mass public anxieties, born of economic insecurity, already threaten to produce a deep and calamitous retreat from international responsibilities. The Cold War is apparently being revived; nuclear conflict is already more openly talked about as a horrifying, yet real possibility.

The nation-state game thrives on self-deception, that we are different and better and more deserving than others. We must change the propaganda. Priority must be given to *common* human rights and common *human* interests rather than sectarian or parochial interests — however dressed-up the latter may be made to look.

Maxwell Brem
Toronto, Ontario,
Canada

No news

With international affairs being felt as close as the corner gas station, it is somewhat perplexing when one considers the dismal state of international reporting in Canadian media. Dennis Schroeder's article, "No news is not good news" (December 1979), documented the rather marginal treatment that international affairs reporting receives, with few exceptions, in Canadian media. Not dealt with in his article is the equally pervasive practice of major Canadian media outlets' extensive reliance upon us outlets for foreign news. AP (Associated Press), UPI (United Press International), the us television networks, all supply a major proportion of what

Canadians read and see about what the world is like beyond our borders. us foreign policy, an American history and perspective, cultural norms, and expectations about the us role in the world are being uncritically accepted as legitimate for our nightly news or daily papers. Historically the convenience and low cost of "rip and read" journalism has rendered a Canadian perspective on foreign affairs the exception rather than the rule. Canadian Press (CP), the Canadian wire service, has a very poor track record in terms of international coverage. CP has almost totally ignored the Third World, and when they do send correspondents into "hot spots" they become the same instant experts that fuel the grievances of those supporting a "new world information order." Evelyn Waugh's novel *Scoop* is not far from the contemporary Canadian performance in coverage of North-South affairs.

In the same issue with the Schroeder piece is a companion article on the WorldPaper. The lofty goals of the publisher, Crocker Snow, deserve support. But there is a significant irony in their list of needs to survive.

The third need is listed as advertising revenue, particularly from multinational corporations. Even a remote acquaintance with the "new international economic order" and its offspring, the "new international information order" makes one realize that it is these same multinational corporations and transnational advertising agencies that have forced many Third World and non-aligned nations to act in unison to protect their frequently fragile economic bases and

cultural identities.

To have an international paper supported by advertising from ITT, IBM, Nestle's, and the like will not attract nor encourage Third World writers and readers.

But it is easy to be a critic. Many agree that McLuhan's global village has arrived at the same time that concern and coverage of foreign affairs and international events has less and less impact on the front pages of Canadian dailies. The growth of "disco journalism" where readers move their hips when they read, with concern about trivial and gossip items dominating readership patterns, does not bode well for a substantial, positive change in international reporting.

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Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. **Editor-in-chief** Michelle Hibler. **Associate editors** English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feferbaum.

CONTENTS

Letters		2
Seeds: patent pending	Is a new plant variety an invention that can be owned and leased? The question now clouds prospects for world agriculture, as Jean-Marc Fleury reports.	4
Changing of the guard	Farmers have preserved our plant resources for centuries. Now scientists relieve them.	7
Commentary NIEO: twist policy and practice	John O'Manique examines Canadian attitudes towards the establishment of the new international economic order.	8
The family factor	How the low status of women in society means high population growth is explained by Michelle Hibler.	10
Briefs	A quick scan of news and trends of interest in development.	12
Dossier Africa into the 80s	As Africa moves into the Third Development Decade, it faces new challenges. The five articles in this dossier describe how research in health, food supply, information, and training is preparing Africans to meet the future.	14
New releases	Recent IDRC publications.	26



Cover A groundnut harvest in Upper Volta — a good harvest brings a measure of prosperity. Efforts to harvest the bounty of science and technology for African development are described in this issue's dossier, beginning on page 14.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in Africa (B.P. 11007, Dakar C.D. Annexe,

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*Can the inventor of a new plant variety own it?
World food production may depend on the answer.*

Seeds: patent pending

JEAN-MARC FLEURY

Recently, in Chile, a new variety of wheat was sown on a number of farms. This in itself was not unusual, because ever since the green revolution began, Chilean farmers have been constantly encouraged to plant new varieties. It happened — and this is more unusual — that this new wheat produced much better yields than previous varieties. Soon, everyone wanted to try it and the new variety has spread like wildfire throughout the country.

But what is truly unprecedented is that a corporation (Dutch) has declared that it owns the rights for this particular seed. The corporation is now reportedly pressing the Chilean government for payment of royalties. Unfortunately for the company, plant varieties belong to

the public in Chile. Anyone may multiply or grow a given seed without paying the institution or the individual who developed it for the privilege.

This situation, which is the rule in developing countries, differs dramatically from what holds in most industrialized countries, where patents are granted to those who — with nature's help — invent or develop new plants. Thus, the European company is trying to justify its policy in Chile partly by arguing that it may, in the country where its headquarters are located, patent the varieties invented by its researchers and thus protect its investments. It maintains that it is only fair for other countries to recognize its rights. Some anticipate that Chile will soon be persuaded to follow the pattern set by

The breakthrough in food production in developing countries was based on the free exchange of information and genetic materials. This sorghum grain in Ethiopia is the product of many hands.



the industrialized countries and adopt a policy that will legally recognize plant breeders' rights — inventors' rights over new plant varieties. Should it indeed adopt such a policy, it would be the first Third World country to do so.

However, many experts believe that the adoption of laws that render seeds patentable, like any machine or industrial process, will not serve the general interest nor, in particular, developing countries.

The Director General of the International Rice Research Institute (IRRI) in the Philippines, Nyle C. Brady, has said that even if plant breeders' rights seem justified in western countries, "it would be very undesirable in the developing countries at this time." Robert G. Anderson, Director of the Wheat Improvement Program at the International Wheat and Maize Improvement Centre (CIMMYT), in Mexico, shares this view. "I can only foresee such laws benefiting commercial seed companies," he said, "I don't see any benefits going to the countries themselves."

"For example," Dr Anderson explained, "when Norman Borlaug began his research in Mexico, he volunteered his most advanced lines (of newly developed wheats) to any company that asked. The seed companies were able to grow and sell those varieties, and earn normal profits. We can't do that any longer. We have now been forced to cut back our shipments of advanced lines to seed companies, because some of them might take out patents. These companies would then have the right to demand royalties on seeds originally created at CIMMYT. Our work is funded by many countries. How would the donor countries react if a seed distributor earned extra profits by selling developing countries seed varieties developed thanks to their research funding?"

"I have nothing against seed companies," Dr Anderson said. "Many are reputable and careful of the public interest. But some unscrupulous distributors could just rush out and patent our varieties in many countries, and force local organizations to obtain distribution franchises from them. In fact, we are now witnessing a proliferation of fly-by-night companies that are only interested in a quick profit, and dishonest individuals have already tried to sell triticale varieties at exorbitant prices in Syria, the Sudan, and Upper Volta."

Dr Anderson insists that "We are for absolute free exchange of plant breeding materials. Every year we ship hundreds of wheat, barley, and triticale lines to 116 countries. Now, however, we cannot afford to distribute our advanced lines to the whole world. Consequently, the innocent suffer with the guilty, and our shipments to the seed

companies are now restricted to the less advanced material and only after the public institutions in developing and developed countries have been supplied."

CIMMYT alone supplies some 2300 nurseries or experimental plots throughout the world. These international trials are the means by which various regions of the world are able to quickly select the varieties best adapted to their environment. Thus, every year, the world's plant resources are enriched with numerous high-yielding varieties resistant to a growing number of diseases. This rapid improvement has been sustained only through intensive international cooperation and the unrestricted sharing of genetic information.

International plant breeding respects no borders, unifying plant geneticists all over the world. It was the very basis of the green revolution, triggered off by CIMMYT (for wheat) and IRRI (for rice). Indeed, that breakthrough in food pro-

*"The laws on
plant breeding will
simply make it
possible for
multinational companies
to further increase
their power."*

duction has been called a genetic revolution. In a recent issue of *CIMMYT Today*, the Nobel prize-winning wheat breeder and "father" of the green revolution, Norman Borlaug, says that the concept of patented seeds "threatens this international cooperation." Dr Borlaug is concerned that the "patenting" of plants may result in a dramatic slowdown in the exchange of information vital to world food production.

The reply made by the advocates of the legal recognition of breeders' rights, such as Wilf Bradnock, Associate Director of the Seeds Section at Agriculture Canada, is that in strictly legal terms, Borlaug is mistaken. "The rights granted to breeders," says Mr Bradnock, who was instrumental in preparing breeder legislation for the Canadian Parliament, "refer only to the marketing of new varieties. Every breeder retains the right to use a new seed to invent new varieties without notifying the original creator of the seed." On the other hand, Mr Bradnock admits that breeders

might be tempted to hold back on certain important materials in order to be the first to produce new varieties. "That is already happening in both the public and the private sector," he said.

"But," he added, "breeders have a long tradition of exchange. It is in their interest to offer their varieties to others." Claude Saint-Pierre, a wheat breeder at Laval University (Québec, Canada) agrees. "It's simply a matter of give and take. I give you my rust-resistant stock. In return, you send me your early-maturing variety. Personally," adds Mr. Saint-Pierre, who favors a law protecting the rights of plant breeders, "I have never run into any obstacles."

Nevertheless, many fear patents will stifle the natural tendency to cooperate. Pat Mooney shares these concerns. He has made his views known to thousands of people in a book entitled *Seeds of the earth*.†

This young Canadian farmer from the province of Manitoba has drawn the attention of the world to the fears raised by plans to introduce laws on the protection of plant breeders' rights. He has also played a central role in a vast movement of public opinion that thus far has succeeded in preventing the adoption of such legislation in Canada, one of the last industrialized countries not to protect the rights of breeders.

Pat Mooney claims that there is a fundamental difference between a patent granted for a machine or industrial process, and an agricultural patent. By protecting the rights of inventors, legislation on patents is in effect aimed not only at stimulating innovation, but also at encouraging the publication of new knowledge. Provision is also made for a patent to lapse when the owner hinders its exploitation. Furthermore, to be valid, a patent must contain a sufficiently clear description to enable "a man of the trade" to reproduce the invention. In this way, industrial patents by their nature encourage the dissemination of information. They also help other inventors to further their work.

According to Mr Mooney, when the concept of the industrial patent is extended to agriculture, the opposite happens. Thus, having produced a variety that possesses exceptional or unique characteristics, he says, a breeder might be tempted to hide or withhold it in order to introduce it into other more sophisticated varieties himself. Moreover, a breeder might keep very rare genetic material that had been dis-

† *Seeds of the earth is available in English, Spanish, or French from the International Coalition for Development Action, Bedford Chambers, Covent Garden, London W.C. 2, United Kingdom.*

Monopoly ownership of seed companies may lead to a world agriculture dependent on chemicals and more vulnerable to disease epidemics.

covered in nature for himself, with the hope of being the first to include it in new varieties. Thus, in Pat Mooney's opinion, we end up hiding and withholding not only new plant inventions, but also things that already exist in nature. "The result," he says, "would be a tendency to hoard plant genetic material."

At a time when the Third World is calling for the relaxation of international regulations on industrial patents, adds Mr Mooney, the proliferation of legislation on plant breeding is a positively regressive step. "The laws on plant breeding will simply make it possible for multinational companies to further increase their power," he concludes.

Another important objection to patenting seeds contained in *Seeds of the earth* concerns the long-term consequences of any monopoly over seeds by the large chemical products companies, which, thanks to the rights of patent-holders, will consider seeds a very profitable area to get into. In the weeks that followed the passage of breeders' rights legislation in England, one company alone (Ranks-Hovis-McDougall) absorbed 84 small seed producers and distributors. The same trend towards concentration has been witnessed in countries that have similar legislation or are contemplating its adoption, such as the United States, France, and Canada.

"What is most disturbing," says Pat Mooney, "is that it is the large pharmaceutical and petrochemical companies that will monopolize this sector." He is convinced that in the hands of the chemical multinationals, seeds may become a sort of chemical "Trojan Horse". Petrochemical companies like Royal Dutch Shell, Occidental Petroleum, and Monsanto, for example, which have demonstrated an insatiable appetite for seed companies, would all be interested in marketing only those plants that have become dependent on the fertilizers they sell. The same applies to pharmaceutical companies such as Sandoz and Ciba-Geigy, which are also in the process of buying out seed distributors. Would it not be in their interest to continue to keep our crops dependent on the herbicides, insecticides, and pesticides that are the basis of their vast fortunes?

Although crop protection programs will always rely at least in part on chemical pesticides, it is nevertheless true that the most economical and practical method of combating predators is to introduce the appropriate defense mechanisms within the genetic structure of plants themselves. Once they have monopolized the seed



Grain bought and sold in the market in Ouagadougou, Upper Volta. Is the right to grow it also bought and sold?

sector, will the chemical multinationals be interested in releasing our harvests from the products that make those same companies rich? For Pat Mooney, this is the central question.

Dr Anderson has also noted a movement towards the concentration of seed firms in the hands of few large chemical companies. "Cartelization is still going on," he said, "and that disturbs me." It should be noted, for example, that in Europe all wheat varieties are sensitive to stripe rust. "Until now," he added, "this disease has been controlled only by chemical means, to the point where it has now become necessary to increase the subsidies paid to Common Market farmers to enable them to purchase all the necessary chemical products." Perhaps Western European countries can afford the luxury of a pesticide-dependent agriculture, but developing countries cannot, says Dr Anderson. High costs and inadequate distribution networks hinder setting up such agricultural systems. In the Third World, the only ways of eliminating predators is by introducing genetic resistance. Dr Anderson fears that when they have become seed distributors, the manufacturers of chemical products will neglect the genetic improvement of plants through breeding. "But only time will tell if my fears are justified," he adds.

Speaking on behalf of several of his CIMMYT colleagues, Dr Anderson emphasized that once plant breeders have

acquired rights, it will then be possible to prohibit non-patented seeds. He fears that such a development would once again work solely to the advantage of seed companies, who will thus be able to reduce the list of approved varieties. Such a narrowing would present a danger of increased vulnerability to diseases, because the genetic diversity of actual cultivated varieties would be reduced. Moreover, the granting of breeders' rights would necessitate drafting very precise standards for plant varieties, absolutely uniform with respect to their genetic content. Thus, the period of breeding and testing would be lengthened, which in turn, would have the effect of shortening the useful life of a variety before it became vulnerable to constantly evolving new strains of disease. It is generally assumed that the granting of plant breeders' rights will involve the standardization of genetic characteristics, and this precisely at a time when numerous wild varieties that are an indispensable reservoir of genetic material are about to disappear (see accompanying article, page 7).

Finally, in a letter on the question, Dr Anderson writes: "There is a real fear that the public system, whether direct government or universities, will be weakened to such an extent that a monopoly on good material could develop among the private companies.... As the private system is further strengthened, senior government administrators could find it tempting to shift away from maintaining plant breeder positions, thus further weakening the system with catastrophic results.... There are very highly legitimate companies whose services have added inestimably to the agricultural product of the world. They should be encouraged. However, it is unsafe and unwise to turn over *all* the plant breeding to the companies. Public sector breeding must act as the governor to keep things even."

In Canada, where the debate on the legal recognition of the rights of plant breeders is now under way, most of the organizations supporting the bill, such as the Agricultural Institute of Canada and the Canadian Federation of Agriculture, also insist that the public sector continue to carry on significant levels of activity in the plant breeding field. Mr Bradnock points out that in England the public sector is as important as ever, even after the laws that permit the patenting of seeds were passed.

We must hope that the same will happen everywhere, because one thing is certain: there will never be too much money or too many people working to increase the world's food production.

CHANGING OF THE GUARD

JEAN-MARC FLEURY

For thousands of years, small farmers in the Third World have been the guardians of the genetic heritage of the world's plants. Each year, they carefully set aside a part of their harvest that their fields would multiply again the following year. Naturally, the best seeds or heads of grain were most likely to be selected and conserved. Thus, sometimes consciously, but most often not, farmers improved crops with each passing harvest.

By modern calendar reckoning, we are approaching the end of the second millenium. Population growth and new needs introduced with development have made it necessary for farmers to increase food production. The quickest means seems to be planting high-yielding varieties that make good use of fertilizers. Thus farmers are turning to varieties developed by the green revolution, but in so doing, they are abandoning their traditional seeds.

Many experts fear that a great many varieties vital to future crop improvement are thus being eliminated from plant stocks. Some propose that farmers be induced to continue planting traditional seed types, thereby continuing their role as phytogetic guardians. In practice, however, such a solution is unacceptable. The poor farmers of the Third World have no choice: their first priority is to feed themselves. How then, can we deny them the benefits of modern crop improvements?

One solution is to increase local potentials for phytogetic research and conservation. The more competent the Third World becomes in the art of phytoselection, the more experts there will be working in these areas where crops originated, ready to take over from the farmers to whom we owe our food supply.

The IDRC, in cooperation with international agencies and the governments of many developing countries, devotes substantial sums of money to strengthening plant breeding capacities in the Third World. In fact, IDRC is participating directly in the species collection of about twenty different basic foodstuffs in more than thirty countries.

One of the most spectacular programs took shape in Ethiopia, the



home of sorghum, where more than 5700 varieties of this drought resistant cereal were collected throughout the country. This is one of the largest sorghum collections in the world, gathered in the very area where the grain evolved. The program provided training for a number of Ethiopian plant breeders, and now a team of professionals works in Ethiopia, ensuring that this essential part of the world's common genetic heritage is preserved. Moreover, collection duplicates were sent to the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad, India, which in turn made them available to researchers globally.

IDRC project funds go toward the collection of indigenous crop varieties, the establishment of national collections (including imported varieties), and toward the costs of sending duplicates of local collections to international centres in charge of coordinating food crop research efforts worldwide. The Centre is involved in setting up millet germ plasm banks in India and Tanzania, and sorghum banks in Mexico, Sri Lanka, Rwanda, and Papua New Guinea. It also supported research that led to the establishment of national collections of important food legumes.

Because of its nutritive qualities and its remarkable resistance to drought, the cowpea is being studied in several programs in Upper Volta, Niger, Mali, Sierra Leone, Sri Lanka, and Bangladesh. Several North African and Middle Eastern countries are setting up lentil and chick pea seed banks. The IDRC also took part in setting up and maintaining collections of sweet potatoes in Cameroon and Sri Lanka, of plantains in Cameroon, of rice in Senegal, and of leguminous

forage crops in Belize, Antigua, and Trinidad and Tobago.

One of IDRC's priorities since its inception has been research on cassava, because this is the basic food of hundreds of millions of people living in the tropics. Germ plasm banks have been built up in more than ten countries. In Brazil, IDRC financed the collection of many wild cassava varieties; duplicates were sent to international centres, and now the International Centre for Tropical Agriculture (CIAT) in Colombia has,

among its collections, some 2000 cultivars gathered throughout Latin America.

Finally, in addition to supporting national and international work in collecting varieties for which responsibility has already been assigned to an international institute, IDRC took the initiative of financing phytogetic banks of crops for which no responsible centre has as yet been assigned. An example of this is the collection of varieties of quinoa—a traditional food dating from the time of the Incas—in Bolivia, and of varieties of oilseeds such as sunflower, rapeseed, mustard, sesame, and safflower.

Dozens of research projects supported by IDRC throughout the world—mainly on food crops of the Third World—are resulting in the establishment of a great many collections of phytogetic material, some of which may be only the working collections of individual plant breeders. They, nevertheless, consist of at least a few hundred varieties, and often tens of thousands, after a few years of crossing. Needless to say, not all varieties are actively used—a researcher's work consists precisely in knowing how to choose the best among them—but the proliferation of working collections and of test plots in developing countries contributes not only to the preservation of our phytogetic resources, but also to their improvement.

In the long term, the plant breeders of the Third World undoubtedly constitute one of the best guarantees that the world's heritage of plant life will be protected. But they are only relieving the guard—carrying on the work of their ancestors who preserved our agricultural heritage up to the present day. □



Coping with the changing world order will require a greater awareness of global interdependence for Canadians

NIEO: TWIXT POLICY AND PRACTICE

JOHN O'MANIQUE

The New International Economic Order (NIEO) is a set of proposals made in the United Nations that would restructure the nature of economic relations between the rich "North" and poor "South" nations, specifically to promote a more equitable distribution of resources and eliminate inequalities. Professor John O'Manique recently prepared a study on attitudes in Canada towards the establishment of the NIEO, as part of the preparations for a special session of the UN on the NIEO proposals later this year. Dr O'Manique is Associate Director of the Norman Paterson School of International Affairs, Carleton University, Ottawa, Canada.

The set of policy objectives that has been developed within the United Nations system during the 1970s and labelled the New International Economic Order (NIEO) is, by its nature, difficult to characterize. Its purpose is to create an international order that would enhance Third World development and promote a more just human society. The proposals to accomplish this relate to, and call for adjustment to, all sectors of society — economic, political, social, and cultural. It is not surprising, then, that the complex and controversial NIEO is seen and judged differently by different people. And, given its newness, it is not surprising that for most people it is not seen at all.

What would one do, then, if asked for an assessment of the Canadian response to the NIEO? The obvious assessment is that, for the vast majority of both decision-makers and the general public, there is no response because the NIEO

is unknown. And for those few who have some perception of the NIEO the responses would often be of little use because of incomplete or even distorted perceptions. When the United Nations Institute for Training and Research (UNITAR) did request such an assessment then, it was decided to identify the salient features of the NIEO for Canada and measure support for, or opposition to them in various sectors of Canadian society.

Official Canadian government policy as stated in *Canada: strategy for international development cooperation, 1975-1980* (1975), appears to be generally compatible with NIEO objectives. Furthermore, some indicators of policy directions, suggested that Canada's overall policy thrust would continue to be very much in line with the NIEO spirit, and indeed, with many of its specific proposals.

The emergence and formulation of an enlightened development policy in Canada coincided, however, with the slowdown of Western economies in general and a subsequent shift in attention to domestic problems. As a result, there exists a considerable discrepancy between policy and practice. For example, although it is Canada's policy to reach the UN target of 0.7 percent of GNP in development aid, the proportion of aid to GNP has dropped each year since 1975 because of a freeze and then actual cutbacks in funding to CIDA.

This discrepancy between policy and practice is unfortunate, but not surprising. The policy was developed in the wake of the booming 1960s and at

a time when greater Canadian involvement with LDCs was being considered as a major part of a foreign policy option. Long-term planning in general and global concerns were characteristic of the early Trudeau years. Official development assistance did increase dramatically during the early seventies. The quality of assistance also improved, IDRC was created, and Canada was seen to be an enlightened, concerned, and generous friend by many in the Third World.

The enlightenment, concern and generosity was not deep-rooted, however. Those who expressed global concerns were in a small minority, whether in the Cabinet, Parliament, or the public at large, and were no match for the swelling expression of domestic concerns over growth and public spending that started in the early 1970s.

The public is not aware of the details of the NIEO issues, and so in conducting the survey we sought no public response to them. We did, however, note some relevant questions put to the Gallup Poll samples. In December 1974, and again in June 1978, approximately 1000 Canadians were asked if the problems of the LDCs were theirs alone or if they were shared by us. In each case about 72 percent replied that we must share in this responsibility. But in 1974, 53.3 percent said aid should be increased, whereas in 1978 the percentage had dropped to 44.3.

One should not say that this shift in public attitude had a direct influence on government policy implementation. In the early seventies aid increased and positive policy

was formulated, not because this was popular, but because some saw that it was good and it *wasn't unpopular*. It probably wasn't even noticed. Continuing to increase aid beyond the mid-seventies, and putting into practice NIEO-related policies would be noticed — the former because of a general increased scrutiny of budgets, the latter because of their negative impacts on an economy already seen to be flagging. The public certainly was not encouraging such measures.

Nor were there any major lobbies pushing our government towards NIEO objectives. Our consultations made it clear that big business is generally opposed to measures that would interfere with the workings of the marketplace. This does not mean that business rejects the NIEO out-of-hand. Those proposals that would free up the market — the reduction of tariff and non-tariff barriers, for example — are supported by business, at least in principle. But those that would impose some control on the system are opposed.

Labour policy in Canada, especially as expressed by the Canadian Labour Congress, is very supportive of NIEO objectives. There is official support even for those proposals that could have the greatest negative effect on Canadian workers. These positive international policies, however, do not play a major role within the labour movement, either among its members or as issues that would be put before government.

Similarly, within Canadian churches and other nongovernmental

organizations (NGOs) there is developing a concern for the plight of the "wretched of the earth" and an attempt to spread this concern among the public. Many church and NGO programs are successful and effective, but not to the extent that a groundswell of public opinion has been created which would encourage more positive government action.

Canada's GNP is roughly equal to the combined GNP of the poorest billion people on earth. If they are even to begin to catch up, some adjustments to the international system will have to be made. We would not suggest that the NIEO proposals as now formulated are *the* answer. But it would seem that some new international order is needed and, whatever its details, it would require some sacrifice on our part.

It would be difficult to explain to one of the poorest billion that we cannot help much now because we have our own economic problems. But this is the case. Our problems, no matter how seemingly minor by comparison, are the problems we respond to, and those to which our government responds.

The problem, in other words, is that the awareness of and concern for development issues began and remained with a few Canadians at the top — in government, in labour, and in the churches. To continue the gains that were made in better times — in policy and practice — a "bottom up" support is essential. A positive public response to international development would have to be based on a heightened awareness of the problems and of interdependence, the awareness that in the

long run we cannot abstract "our" problems from "their" problems.

The UNITAR survey itself deals in some detail, of course, with the responses of various sectors of Canadian society to the specific issue areas of the NIEO. Since its publication, and as part of a twenty-nation study also sponsored by UNITAR, we have done a more complete survey of attitudes of Canadian decision-makers and experts on the NIEO. The preliminary results of this survey are now coming out of the computer and, so far, would appear to confirm our earlier "first approximation."

It is worth noting in closing that in this recent study, 67 percent of the Members of Parliament, senior civil servants, and chief executive officers of large corporations interviewed opined that the present world economic system is undergoing a major crisis, and 62 percent felt that major structural changes are required to bring about a satisfactory situation. There is no easy consensus on what changes are required, but surely, whatever they are, they cannot ignore the wretched of the earth. □

The full text of Dr O'Manique's study has been published in *The United States, Canada and the New International Economic Order*, Laszlo and Kurtzman (editors), New York, Pergamon Press, 1979.

Commentary provides a forum for readers to explore topics raised by Reports, or to present alternative perspectives, informed opinion, and analyses of development issues. The views published are not necessarily those of the editors or IDRC.



Jack Redden

THE FAMILY FACTOR

WOMEN'S ROLES AND FERTILITY

MICHELLE HIBLER

“Womanhood is nothing to be happy about, though I don't regret because I married, but women have a lot of work to do, especially when they get married. Children cause a lot of work. In fact, the work for them isn't tiring, but a lot of work at home and commitments are tiring, and these things men don't care very much about . . .”

So spoke an old village woman in Kenya in the course of an interview conducted by project researchers of the Office of International Science of the American Association for the Advancement of Science (AAAS). The project, officially called *Ethnography of Reproduction*, sought to contribute to the knowledge of the impact of development on women's roles and on population.¹

Studies of women's roles or women's status and fertility have multiplied in recent years. Now, halfway through the Decade for Women, some of them are yielding results — information about women's place in society, their hopes and aspirations, and about how and why they make decisions about family size. All point to the complexity of the reasons behind fertility decisions and to the symbiotic and cyclical relationship between population growth and development.

Population planners and, therefore, population programs had until very

recently largely assumed that fertility was basically irrational and that unless society intervened, women would continue to have as many children as nature allowed. That this myth is being dispelled is partly due to the recognition that the motivation behind childbearing is practical as well as psychological.

Recognition has finally come that women, as well as men, need some sense of purpose and accomplishment in life. For too many women, this is provided only in terms of motherhood. By isolating women from the mainstream of economic, social, and political life, many cultures have given them no real alternative beyond childbearing. And by blocking women's access to education, employment, and participation in community life, a society may be closing off those avenues that hold the key to effective population programs.

THE EDUCATION FACTOR

Conventional wisdom would have it that if women had fewer children, they would be free to continue their education and enter more in the labour force. It is now realized that this may be putting the cart before the horse: education and employment may in fact determine fertility.

The number of years of schooling a woman has is the most apparent and measurable element in the factors affecting fertility. Thus, many planners have seized upon education in the attempt to get a quick fix on the population problem. Numerous studies do, in fact, corroborate a relationship in which the more education a woman

has, the fewer children she is likely to have. In Turkey, for example, it was found that illiterate women have on average 4.1 children, while primary school graduates have 2.6. The rate drops to 1.9 for women having completed secondary school (see box). In Argentina and Paraguay, illiterate women have twice as many children as women with secondary education.

How education and fertility interact is not yet fully understood. Education exposes women to new kinds of information, and by removing them from their family surroundings, can bring about a change in self-image, fostering different values and aspirations. It can delay marriage and, in some cases, inhibit it altogether by reducing marriage prospects. It can open the door to employment outside the home, and trigger social and geographic mobility.

Literacy certainly facilitates the spread of birth control information and increases knowledge and understanding of various contraceptive methods. In an IDRC-supported study in Turkey, educated women were found to use contraception more than their uneducated counterparts, and to use it more effectively. The level of education of the community as a whole was also found to be a determining factor.

WORKING FOR MONEY

The more education a woman has, the more likely she is to work outside the home. But how does employment itself affect fertility? The prevailing theory is that the more difficult it is made for a woman to care for her children and home while working, the fewer children

† A report entitled *Village women, their changing lives and fertility*, was published by the AAAS, 1776 Massachusetts Ave NW, Washington DC 20036, USA, in 1977.

will have — unless of course she abandons work.

Participation in the modern labour sector appears to substantiate this view, as most urban jobs are not compatible with child care. They also expose women to new ideas and people, remove them from family influence, and help to change family dynamics by calling for greater involvement of husbands in household work. Centre-supported studies on the value of children in eight countries confirmed that woman's employment affected her status in the family, which in turn affected her fertility decisions and desires. It was also found, however, that the location of the job and the occupational category — professional vs manual or service jobs — were more important factors than simply working.

In practice, however, most women in developing countries are engaged in traditional occupations — agricultural work on family farms, crafts, produce marketing — that seem to have little effect on fertility because they do not conflict with child care. This is particularly so where extended families can provide child care. Few opportunities exist for women to participate in nonagricultural sectors of the economy.

THE MOVE TO THE CITY

Both education and work opportunities are facilitated by urbanization because of the greater opportunities in the city. But if the move to the city represents freedom from the constraints and traditions of rural life and a chance for higher education, employment, and new independence for some, for others it means being cut off from the child care facilities afforded by the extended family and a new, more rigid division of labour.

In Korea, a study of how the changing role of women since 1945 has influenced fertility behaviour concluded that a degree of urbanization — down to the small town level — affected the amount

of spouse participation in major household jobs and the degree of egalitarianism in decision-making. The more "modern" the wife's role — defined in terms of role perception, communication, decision-making and participation — the fewer children she tended to have. Interestingly, these "modern" women often wanted as many children as their traditional counterparts, but did not carry out their desires.

Education and work experience were the major factors influencing the emergence of modern role attitudes and more egalitarian husband-wife decision making. This was equally true in Argentina and Paraguay where it was

found that education counteracted the negative effects a husband and children had on female labour force participation. Age at marriage and the level of education were the most significant predictors of fertility levels in Korea, and age determined the practice of contraception.

RIGHTS AND REALITIES

Still, the most important element in the fertility equation is probably woman's power or rights within the family.

In many countries and societies, women begin life unequal. The birth of a daughter is often greeted with disappointment, or as an old Korean proverb

30 to 50 percent higher than for boys the same age. Fewer girls attend school, the result of a host of mutually dependent ideas and traditions that limit the female role. And while more women are now attending school, they still account for two-thirds of the world's illiterates.

Girls are also married as unequals. Although most countries have set a minimum legal age for marriage, girls in traditional societies are often married young, to a partner chosen by their parents. As the husbands are generally older, the girls' subordinate position is compounded. A recent survey in North India, for example, revealed that 57

percent of girls were married before the age of 15 despite a law setting 18 as the minimum age. Even in less traditional urbanized societies such as Argentina, the presence of a husband was found to have a strong negative effect on women's labour force participation, whether or not she had children.

In many parts of the world, uneducated, unemployed women in male-dominated societies control few resources beyond their children. Having a large number of children is for them the best available means of meeting their own ends, economic as well as social. As their other activities are overlooked and underrated, child-bearing becomes women's major source of status. As long as no acceptable alternative roles exist, it is foolish to believe that their fertility behaviour can be modified.

It is also naive to believe that it is possible to change an aspect of society such as the status of women without major social evolution in other areas as well. Policymakers can only facilitate the changes underway by removing the tangible barriers that limit women's access to education, work, and personal autonomy.

As more is learnt about the interaction between women's roles and fertility and

the multiple factors that intervene, it becomes clear that there is no one variable that can be manipulated to effect change in population growth rates. Instead of asking 'How do we prevent women from having large families?', population planners must now ask 'How do we make it possible for women to have small ones?' □

TURKEY: A CASE IN POINT

In 1975, 52 percent of Turkish women over the age of 6 were illiterate. Only 33 percent of those over 11 had completed primary school. An IDRC-supported study on the impact of education on women found that despite equal education legislation, education facilities in Turkey were inadequate and discriminated according to sex and to socioeconomic status.

The Turkish female labour force, perhaps not surprisingly, consists mainly of uneducated women working at agricultural tasks. Moreover, participation is declining for women.

Labour force participation is even lower in urban areas, dropping to a mere 9 percent. As the project report suggests, women "compete with men for the limited job opportunities and uneducated women have almost no power in competition." And while educated women may have a higher participation rate, almost all are engaged in the service sector — food preparation, domestic service, health, and education. "The education system functions to support this biased structure. . . . Female oriented occupations are clearly identified in every part of society," says the report.

Uneducated married women have the least chance of working and, whatever women's educational level, participation in the labour force is adversely affected by marriage and motherhood — 35 percent of women stop working at marriage and a further 18 percent drop out when a child is born.

The report concludes that the educational system in Turkey cannot be expected to bring about improvements in the condition of women. Measures must be implemented to promote the development of all individuals, says the report, but the burden of change cannot rest on education or be considered independently from the problems in the social, economic, and political spheres.

would have it: "A daughter lets you down twice; once when she is born and again when she marries". Sons are a measure of social security but daughters who will marry out of the family — often at a cost in terms of a dowry — will only serve others. The general devaluation of women's traditional roles, and few opportunities to enter new ones, means that their contribution to family welfare is ignored.

Born unequal, girls grow up unequal. It has been shown that they feel the pinch of food scarcity earlier, more frequently, and more severely than their brothers. In Bangladesh, for example, the mortality rate of girls under five is

To date, IDRC has supported more than 20 projects that touch on fertility determinants in Asia, Africa and Latin America.

Nabbing the hatchet man

An editorial in the *Egyptian Gazette* recently reported on the sentencing of a Cairo man to six months imprisonment together with a fine of LE 500 (\$Cdn830) for fatally assaulting a tree near his home in North Cairo. The man, a 55-year-old builder, was described as a "hardened tree-killer", and known to have felled more than two dozen trees over the previous two years.

The editorial pointed out the pollution levels in Cairo and other cities in Egypt had made the air "poisonous". Industrial air pollution and inadequate greenery contributed to "outrageously high" levels of carbon dioxide. The newspaper added that a thorough campaign to clean the air would require the banishment of industrial zones, banning use of dangerous insecticides, easing population densities, and other equally heavyweight schemes. It would also require the planting of a million trees.

Deploping the action of the hardened tree-killer, the editorial noted that "It takes little more effort to plant a tree than it does to chop one down, though it takes years or even decades for a tree to reach full maturity. But it is the hatchet men, not the spademen, who have had free rein in the city's parks and gardens. This situation must be reversed."

The trial never happened. Hardened tree-killers still run loose, in Cairo and elsewhere. The editorial was just a way of dramatizing the problem. Many concerned with the environmental damage caused by the destruction of trees and whole forests would agree however, that criminal prosecution is just the sort of tool needed to begin the reverse.

Salmon spawns sales

Canadian salmon are making their way on the world export market, but not solely as a delicacy for the tables of the rich. Thanks to Syndel Laboratories Ltd of Vancouver, Canada, Pacific salmon gonadotropin — a pituitary extract used to induce breeding in fish — and a variety of other hormones are now being marketed commercially in Southeast Asia.

The breakthrough in using gonadotropin to induce breeding in milkfish and other fish cultivated in aquaculture systems in Asia occurred in 1976 in the Philippines, in an IDRC-supported project. Using the experience and knowledge gained in this area through Centre projects, Syndel undertook to provide crude salmon hormone on a commercial basis and provide other hormones — somatotropin, thyrotropin and prolactin — for research purposes. A simple and reliable radioimmunoassay technique has also been

ped for the hormone.

Again with IDRC assistance, Syndel contacted aquaculture experts throughout the world. So successful was the venture that Syndel, in collaboration with the Canadian International Development Agency (CIDA), is undertaking a feasibility study of the commercial use of salmon hormone to induce breeding in freshwater species in Indonesia. Liaison has also been established with research centres in Hong Kong and the Philippines. As a result of this initiative, aquaculture centres in Asia should be able to obtain a reliable and steady supply of hormones.

Squashing square tomatoes

If a lawsuit recently filed in the USA is successful, the University of California may soon be reaping what it sowed — by paying damages resulting from one of its inventions, the square tomato.

The California tomato, described as "hard, square and pulpy," was created to meet the requirements of mechanical harvesting. It came about because the University developed a mechanical harvester for tomatoes that couldn't handle the familiar product — round, ripe and juicy with a tender skin.

The machines were quickly adopted in the USA, causing a great deal of unemployment. Many

smallholders were obliged to sell their farms and a number of processors and wholesalers were put out of business. As a result of this increased market control, the price of tomatoes rose although the costs of production did not increase.

Those most harmed by the innovation have decided that the university should pay the social costs. The case could set a precedent, establishing the responsibility of public institutions to weigh costs and benefits of their activities that have predictable socioeconomic repercussions. It may also be a victory for the consumer: the square tomato is described as an "offence to the palate".

New Internationalist predicts...

In the first issue of the new year, *New Internationalist* has come forward with a batch of provocative predictions for the decade. The UK-based magazine challenges readers to keep the forecast for ten years, on the offer of a free subscription if less than five of the ten come to pass. The predictions?

- That the most troubled nation of the 1980s will be Russia, due to the depletion of oil reserves and economic stagnation triggering unrest in ethnic populations.

- That multinational corporations manufacturing consumer goods will

A tree falls in Cairo, salmon gonadotropin is marketed, a tomato is prosecuted, and the shape of the 1980s is predicted.

withdraw investments in developing countries.

- Unemployment will become the greatest political problem of the decade in developing countries as over five hundred million will be unable to find work.

- The energy crisis will be solved, as known oil reserves will be found to be two to three times higher than present estimates.

- Anarchy will come into vogue as a political and philosophical alternative.

- Multinationals will begin a massive public relations campaign to buy social, cultural, and political acceptance.

- There will be revolution in the Philippines.

- The nature of work and education will change significantly in developed countries.

- The Americas — Canada, the United States, and portions of Central and South America and the Caribbean — will form an economic "common market" alliance.

- Australia will become the greatest supplier of mineral raw materials for the industrialized West.

The diesel tree

Tap a hole in a mature copa-iba tree in the Amazonian forest of Brazil, and what runs out is diesel fuel.

The copa-iba is one of a number of Brazilian relatives of the rubber tree. Through photosynthesis, it reduces carbon dioxide

and water to a hydrocarbon sap that runs in vertical pores the length of the trunk. Mature trees of about 100 years, with a girth of a metre and standing up to 30 metres high, have been known to yield 10 to 20 litres of sesquiterpene hydrocarbons (a family of hydrocarbons found in essential oils and resins — turpentine is one) in two hours from a single tap. The trees can be retapped at six-month intervals.

Although the tree's oily sap had been used as a base for perfumes and as a healing ointment on cuts, the tree's other potential had gone unrecognized until the visit of a researcher with an interest in biomass fuels.

Interested groups are quickly making up for lost time. Brazilian experimenters reportedly have run a truck on sap taken directly from the tree, and have germinated 2000 seeds from wild species for a "petroleum plantation" trial. Although it is unlikely that the tree will survive outside its natural tropical habitat, researchers at the University of California have been promised seeds from the Brazilian stocks.

A diarrhea vaccine

Intestinal infections and associated diarrheal diseases are a leading cause of illness in young children in developing countries. According to the World Health Organization (WHO),

there are between five and 18 million deaths from diarrhea each year, and in the poorest countries, one of every seven babies will die of diarrheal disease before the age of three.

In 1973, a previously unknown virus — rotavirus — was identified. It is now believed that this wheel-like family of viruses is responsible for an estimated 40-50 percent of all cases of infant diarrhea.

The successful growth of a strain of rotavirus under laboratory conditions, by a team of researchers from the US National Institute of Allergy and Infectious Diseases, is the beginning of a process that could ultimately lead to a vaccine to counter this pernicious killer, reports the January 11 issue of *Science*.

Using newborn germfree piglets, scientists administered rotavirus from the feces of an infected patient, and transferred the virus from piglet to piglet for 11 passages. The virus mutated sufficiently to become adapted to growth in laboratory-grown monkey kidney cells.

Growing human type 2 rotavirus in a culture outside the body should make it easier to study and determine its properties and characteristics. It should also permit researchers to manipulate the virus and produce weakened strains suitable for use as a vaccine.

Alcohol abuse threatens development

Drinking and development don't mix, according to a report on alcohol-related problems released by WHO (World Health Organization).

Alcohol-related problems now rank among the world's major public health concerns, not only in most industrial countries, but also in developing countries.

Crime, traffic accidents, absenteeism (and as its consequence, low productivity) are the major concerns — all place a strain on already overburdened health and social services, and threaten economic development in Third World countries. The report identifies those with professional and managerial skills, vital and scarce in developing countries, as specially vulnerable to drink because of job-induced stress.

The rise in alcohol abuse is not due to "something innate in the individual" — the conventional explanation — but is "directly related to the degree of exposure to drinking," according to the report. Increasing production, a general lowering of prices, commercial pressure to consume, and the eroding resistance to alcohol even in cultures with strong traditional sanctions against it, have helped create an "alcohol environment." □

A novel hydrocarbon is discovered, progress on a rotavirus vaccine is made, and an alcohol environment is fought.

AFRICA INTO THE 80'S

Immense problems must still be overcome as Africa enters the Third Development Decade. But throughout the continent, nations bubble with the ferment of development.

Africa. The second largest continent where some 450 million people, in over 50 countries, are unevenly spread over 30 million square kilometres of deserts, savanna, bushlands and rain forest. In 1945, only four countries in all of Africa ruled themselves. Today, all but two territories shape their own destinies. Almost without exception they face problems as gigantic and as diverse as the continent itself and the majority rank among the poorest countries of the world.

The development strategy for the 1970s — the UN Second Development Decade — called for an annual increase in the Gross Domestic Product of developing countries of at least six percent, a growth in per capita GDP of 3.5 percent, and a growth in agricultural production of four percent. In African countries, the per capita growth in GDP averaged only 0.2 percent and agricultural production increased far less than the population. Africa has the world's lowest literacy rate and its people have the shortest life span.

This is not to say that Africa is stagnating. Development is occurring and progress is being made on a number of fronts. IDRC is participating in that effort, as this, the last of the *IDRC Reports* regional dossiers, illustrates. And as strategies are being mapped out for the Third Development Decade, the Centre will continue to assist the nations of Africa in their development efforts. At last October's Board of Governors meeting, it was, in fact, decided that the poorest countries, particularly those of Africa, would be a focus of IDRC support.





JAMBO!

ON THE CIRCUIT IN EAST AFRICA

A.A. LAQUIAN

Dr A.A. Laquian, former Associate Director of IDRC's Social Sciences Division, spent two years based in Nairobi directing a project aimed at contributing to the development of young social scientists and research institutions in East Africa. In this article he gives us a personal account of those two years and provides a candid overview of the state of social science research in the region as well as of the most pressing needs.

Dr Laquian is presently teaching at the University of the Philippines in Manila.

Jambo! The cheerful note of the universal East African greeting broke the morning chill around a thorn enclosure housing a Samburu family deep in Kenya's northern frontier.

An answering *jambo* from a hut within the enclosure. A man came out, wrapped in an orange robe, a business-like knobkerrie discreetly tucked in its folds. A Samburu guide quickly informed the man that a person from a foreign country wanted to talk to him. His long explanation was met with stony silence. The guide explained that the foreigner was doing a research project on living conditions of the Samburu. More silence, tinged with suspicion. The guide offered the man a pinch of tobacco. He handed candies to half a dozen children who had shyly gathered around. The Samburu in the orange robe smiled, made himself comfortable by the fire tended by one of his

wives, and signalled his willingness to answer questions.

Another IDRC project was launched in East Africa.

I was the "person from a foreign country," and as director of the Social Sciences Development Project (SSDP) in East Africa, my task was to encourage social science research in the region. The research projects cover such varied subjects as the changing role of women among seminomadic tribes in Kenya, the impact of urbanization on former pastoralists in the new Tanzanian capital of Dodoma, the impact of World Bank sites and services projects in squatter areas of Lusaka, and the implementation of the tribal grazing lands policy in Botswana.

So varied and far-flung were the projects supported under SSDP that I earned the name "circuit rider", a term borrowed from travelling pastors and judges common in America's pioneer

days. My appointment to a job with such an unlikely name best typifies the IDRC style of technical assistance. In Nairobi, people were hard put to figure out what a Filipino, who had been trained in the United States, was doing as a "circuit rider" in Africa, supported by a Canadian agency. The answer was in the SSDP's objective — "to contribute to the development of younger social scientists in East Africa."

To achieve the SSDP's goal, I was given rather broad authority: I could recommend small research grants for young scholars, support seminars and conferences, fund publication and dissemination of research results, donate books and equipment, teach courses and give lectures, and lead young social scientists in field research studies. The first two years of the project were experimental. The IDRC did not want to come to East Africa with preconceived notions of what had to be done to help develop the social sciences.

FLYING THE CIRCUIT

The 2-year period between June 1977 to July 1979 was not a particularly auspicious time to be circuit riding in East Africa. The week I arrived in Nairobi, East African Airways was disbanded. Soon after, the East African Community composed of Kenya, Tanzania, and Uganda was dissolved, and the border between Kenya and Tanzania was closed. The Ugandan border was open, but stories of atrocities were enough to discourage anyone from going in. Ethiopia and Somalia were embroiled in a war over the Ogaden. In Southern Africa, punitive raids were launched by Rhodesian forces deep inside Zambian territory. Finally, Tanzanian and exiled Ugandan forces invaded Uganda and overthrew Idi Amin.

The climate for social science research in East Africa was also not conducive to development. In relatively progressive countries like Kenya and Tanzania, more than two decades of local university and international training had created a body of social scientists with the skills to do research. Even here, however, scholars found themselves too involved in teaching, administration, and consultancies to do much research. Conditions were much worse in the small landlocked countries of Southern Africa. There, expatriates often made up 70 percent of university faculties, and while they were involved in research, the results were often pub-



The relevance to reality and the cultural foundations of social science concepts had to be demonstrated.

sent abroad. Often, graduate students were innocent of knowledge of even the most basic statistical approaches. Courses in mathematics, when given, stressed make-work exercises following standard formulas. The object of teaching often seemed aimed at passing Cambridge school examinations rather than applying mathematics to everyday life. Teaching research methods therefore required more than showing how certain data gathering or data analysis techniques were used. Their relevance to reality and the cultural foundation of social science concepts had to be demonstrated as well.

Taking young researchers out on field trips was not a problem. They saw it as an exciting safari, a chance to get out of the drilled lessons of the classroom. Formulating questionnaires and interview guides was also no problem, although linguistic challenges arising from the many tongues spoken in East Africa abounded. Interviewing forced young researchers to lose their shyness. Often, it also showed how far removed and alienated they had become from the basic foundations of

research. Being both personally and professionally involved in all the projects, I gave lectures to researchers, often in safari camps around a bonfire, under the stars. The research seminars were held in unlikely places. One session dealing with correlational analysis linking a Christian education with female circumcision and prostitution was held, appropriately enough, in the back room of a bar in northern Kenya. Another session analyzing health statistics that showed venereal diseases as second only to malaria in incidence among nomadic pastoralists was held in a Roman Catholic mission.

Personally attending to all these small projects located in a dozen countries really meant flying the circuit. Jets, buses, Land Rovers and sometimes, just walking, took me out of Nairobi almost 60 percent of the time. The students and researchers who joined in the field work, however, learned how to do research in the best possible way.

LEARNING BY DOING

I believed that research skills cannot be adequately taught in the classroom, unless that classroom is the big real world. I taught a graduate course in research at the University of Nairobi, but every opportunity was taken to take students on field work. Other researchers supported by SSDP were also encouraged to do the same.

Research traditions in East Africa have primarily been set by Europeans interested in ethnography, anthropology, history, and linguistics. Many African researchers, for example, are studying such topics as the historical background of Arabic influence on the coast, the spread of Swahili into the interior, the ceremonial uses of royal poetry among the Bemba, the deciphering of aboriginal rock paintings in caves around Kondo, or the practice of polygamy and bride wealth among the nomadic Pokots. The techniques favoured are participant observation or gathering of oral histories. The use of social surveys, quantitative techniques, and statistical analysis are often considered inappropriate, if not irrelevant.

Teaching quantitative methods in research was also hindered by the poor mathematics background of stu-

dents. Often, graduate students were innocent of knowledge of even the most basic statistical approaches. Courses in mathematics, when given, stressed make-work exercises following standard formulas. The object of teaching often seemed aimed at passing Cambridge school examinations rather than applying mathematics to everyday life. Teaching research methods therefore required more than showing how certain data gathering or data analysis techniques were used. Their relevance to reality and the cultural foundation of social science concepts had to be demonstrated as well.

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their culture. University students in most East African countries usually come from middle and upper income groups and thus they often found it difficult to adjust to the lack of comforts in the field. Some had also developed attitudes of superiority, which pastoralists and villagers quickly sensed, thus creating some difficulties.

Happily, there are a number of trained African researchers who could take the time to help train younger researchers under apprenticeship arrangements. These researchers were given SSDP grants that enabled them to pursue their research interests. Part of the deal was that they would take young indigenous researchers under their wing and show them research techniques. In a few cases, the researchers were interested expatriates, in others, they were nationals of African countries other than the place where the studies were conducted. Thus, a few Ugandan professors living in exile became primary researchers in SSDP projects in Botswana, Tanzania, and Zambia. Even a national tragedy such as the exodus of trained Ugandans from

their country there, could be turned into an advantage when the resources were available.

PIGGYBACKING

The SSDP, with only \$25 000 a year for operations and activities, could only provide modest grants. However, IDRC was supporting projects requiring almost a million dollars in East Africa, on such topics as an evaluation of the decentralization program of Tanzania, a study of rural development in Kenya, the impacts and effects of sites and services projects on former squatters and slum dwellers in Zambia, and the resettlement of nomads in Somalia.

IDRC's human resources development program also provides scholarships for researchers involved in projects. In monitoring and managing IDRC projects, therefore, I was on the lookout for young African researchers who could benefit from further training. Thus, in the sites and services evaluation project in Zambia, the primary researcher and a research associate obtained grants for training abroad. Another grant went to a researcher in Senegal, to enable him to get a postgraduate degree in Canada.

An important advantage of project-related scholarships was that performance in the project became a test for an award. I was given ample time to assess the academic potential of the researcher in the course of the project. In the case of during-project scholarships, the researcher was given the opportunity to return to the project after the grant, thus directly applying this new knowledge. By taking advantage of the availability of IDRC grants in this way, project funds were stretched. In a few cases, SSDP funds allocated to augment IDRC funds made it possible to pursue training activities that were not part of the original design.

PUBLICATION SUPPORT

No one can accuse East African researchers of being engaged in the "publish or perish" race. Scholarly publications by indigenous researchers are few and far between. Academic journals tend to be dominated by expatriate authors. Publications also tend to be quite expensive, out of the reach of the average student.

Matters became worse in East Africa with the collapse of the East African Literature Bureau (EALB) in 1977. The EALB, with the support of the now defunct East African Community, published the works of African scholars and subsidized the publication of some 20 journals. Commercial publishers have not been able to carry on the work of the EALB as no public subsidies are available. Kenya and Tanzania have created government presses, but their work is primarily geared to publishing school texts. Scholarly publications in East Africa, therefore, have been largely ignored in the past two years.

With its meagre resources, the SSDP tried to support some publications. Assistance ranged from making it pos-

Local researchers need to be nurtured and trained, supported in their common efforts by associations or networks.

sible for authors to have their manuscripts typed, to subsidizing journals and books. A particularly critical need in East Africa is textbooks in various social sciences, as well as on research methodology. Thus, a small grant made it possible for a number of economists at the University of Nairobi to write a textbook on economics. The grant, for advance orders for the book, covered part of the printing cost and thus enabled the publisher to sell the book at 40 percent less than the commercial price.

Support for publications by SSDP hardly scratches the surface and more funds are needed. There is a critical need to support social science journals that can carry the works of indigenous researchers. There is a need for textbooks, and those published in Europe and America may claim to cover "universal principles", but the subjects they cover and examples they use are alien and inapplicable to East Africa. There is also a need for well-written, popularized versions of research results for policy makers and laymen. Without a vigorous publication program, it will be extremely difficult to maintain the interest of scholars in social science research.

SOCIETY OF PEERS

Another activity pursued during the project was the formation and encouragement of social science associations and "networks". A social scientist

needs a peer group against which ideas can be tested. Without this group, a scientist might be tempted to look to an international audience for work evaluation. Burdened with myriad local duties and isolated from the trends of international social science, the local researcher might lose interest.

Since 1975, an informal group of young social scientists has been active in East Africa under the name of East African Social Sciences Research Coordinating Group (EASSRCG). They have no constitution, no formal set of officers, but each year, somehow, they are able to hold a seminar where papers are presented, criticized and reproduced for dissemination. IDRC supported a number of these seminars.

Again, the efforts of SSDP are small given the vast need for regional associations and networks in East Africa. It has been observed that it is often much easier for an African social scientist to write and present a paper for an American or European audience than to do this in his own country. Funds do seem more abundant for the former. The need, however, is right in the region.

EXPERIMENTAL APPROACH

The "circuit rider" project was an experimental venture, launched by IDRC to find an innovative way of enhancing the development of the social sciences in East Africa. A number of things learned during the two years the project was in operation could possibly

influence the pattern of IDRC assistance in the region.

First, it became quite apparent that small research projects that directly respond to the research interests of African researchers are more effective than large projects requiring research management capabilities from local institutions. Such small grants are particularly effective when they augment local resources already committed to research.

Second, research training is much needed in East Africa. The most effective way of learning how to do research is by actually doing it. An apprenticeship approach that allows younger researchers to work closely with experienced scholars is an excellent way of combining research with teaching.

Third, despite the fact that international donor agencies have been assisting the social sciences in East Africa in the past couple of decades, there is still a need for scholarships and training opportunities. Trained African researchers are in great demand for administrative and teaching jobs. Their numbers must be augmented if research is to be done in a continued way.

Fourth, publication and dissemination of research results is badly needed. Textbooks by local authors using indigenous cases and examples are required. Journals have to be supported, and well-written popular reports for policymakers and laymen should be published to create a wider audience for social science research.

Fifth, if social science as a career is to be pursued by dedicated individuals in East Africa, there is a need for associations and networks to support common efforts. There may be political difficulties and linguistic problems attached to regional groupings, and travel and communication might hinder their formation. These difficulties, however, only serve to highlight the need for collaborative efforts.

Finally, the SSDP experience shows that encouraging the development of the social sciences in East Africa is a labour-intensive effort. Unlike Asia or Latin America where there are many trained researchers, donor agencies in East Africa cannot hope to receive research proposals from indigenous researchers, evaluate them, sign the agreement, and then receive research results. For some time to come local researchers will need to be nurtured and trained. □



Studies on the impact of settlement schemes, such as this one in Botswana, were the training grounds for younger researchers.

OUTLINING THE GREAT UNKNOWN:

An interview on tropical disease research with Joseph Z. Losos

Dr Joseph Z. Losos, an epidemiologist and Associate Director of IDRC's Health Sciences Division, spent the last two years on secondment to the World Health Organization Special Programme for Research and Training in Tropical Diseases at the newly created research centre in Ndola, Zambia. Dr Losos was interviewed about the assignment for IDRC Reports by Associate Editor Rowan Shirkie.

Reports: Perhaps we could start by putting the tropical disease program in context. Why this special focus?

Losos: Tropical disease has been ignored, as far as research is concerned, virtually from the time the first of the "old guard" left the colonies in tropical Africa. For some reason, whether it was politics, the world situation, war or whatever, there has not been much research as such. In 1972–1973 WHO decided to develop a program for research in what they considered six of the major tropical diseases (malaria, trypanosomiasis, leishmaniasis, schistosomiasis, filariasis, and leprosy). IDRC had a role in initiating the program. This was a sort of springboard.

Reports: In a sense then, is the program trying to correct a history of neglect?

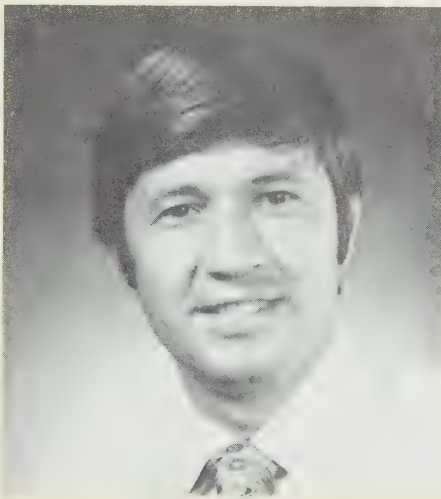
Losos: A lack. A lack in the last thirty years. Look at the world medical research situation. The amount spent in cancer research in the USA per year is \$400 million: the TDR (tropical disease research) program has \$25 million globally for a year for all six tropical diseases, which covers what... 3 billion people? This is a phenomenal research lack. There is a lack in the whole spectrum of research from the natural history of disease through to therapeutic practices. There is a fantastic need for better therapeutics, better diagnostics, better knowledge of the natural history of disease, and to coordinate all these efforts.

Reports: Epidemiology has been described as an ecology of disease, or illness in its environment. Could you explain a little of the particular study you undertook?

Losos: I was given the task of setting up a longitudinal, which means long-term, study in the six diseases with a transdisease orientation. I was to visit geographically varying areas of Zambia and take statistical samples of

villages in these areas to determine what epidemiological disease patterns exist. That meant the six diseases in the context of whatever other diseases existed in the villages... a transdisease orientation, that is what that phrase means.

This was an attempt to draw a very detailed and accurate baseline. It entailed going out with a team of microbiologists, a number of technicians, several physicians besides myself, and a slew of technical assistants and nurses, with a very sophisticated laboratory system. It was very expensive, it used to cost us something like \$250 just in gasoline for one vehicle to get to and from the target site. But it has never been done before over a long period of time.



Joseph Z. Losos

It was epidemiologically being classic, a study of host-agent-environment in communicable diseases. A baseline is drawn in these communities for the application of whatever control programs other research came up with. The findings will apply the esoteric laboratory research to the actual community host with a thought to the environment, the type of causative agent, and so on. It is the link between these two things.

Reports: What did you find?

Losos: Well, as we suspected for Zambia, the diseases were hypoendemic... low in density. Malaria was present at fairly low levels, although this was the first time I have ever seen four malaria types present in individuals throughout a community. Schistosomiasis was present, in fairly high levels in places, and some trypanosomiasis... some leprosy, no

leishmaniasis and no filaria. A lot of malnutrition. WHO is predicting an increase in trypanosomiasis in various places in Africa in the next few years, and in Zambia it has already started. Tsetse flies, which are the carriers, have been seen in villages now, where before they seemed to stay away in protected bush areas. So there are ecological shifts, epidemiological shifts in that disease which are unexplained at the moment.

Reports: Where is the program going then, and what is its future?

Losos: That depends. The tropical disease program has a STAC — scientific technical advisory committee — that is reviewing Ndola in depth. The problems with the world economic situation are already reflected in TDR funding in that pledges were frozen at last year's levels, which is in effect a 10 percent cut. Next year the program needs about 35–40 million, and it is debatable whether the big donor organizations will come up with the increase. There is a real problem in aid or donor mentality — they don't realize that if you're going to get into some of these programs you have to get in for the long term. You have to have a continuum. The world community started a program that should logically last 20 years, at least. You can't do research like this in two years, it is just not feasible.

Reports: If the program were to survive the financial threat, what do you think the technical prospects for success are?

Losos: Well, there is a feeling that we are fairly close to, by fairly close say 10 years down the line, a malaria vaccine. There is a new, very promising drug — mefloquin — that originated with the Americans from researches undertaken in Vietnam. They may be a bit closer to that with a leprosy vaccine. These are all certainly still in the laboratory setting and nowhere near clinical application. The clinical pharmacology people were working on two drugs against schistosomiasis: proisiquantil and metrifonate.

In this whole spectrum, not only what the disease does at the community level, but what it is at the molecular level, we're still just trying to delineate what we're dealing with. All of these diseases have been known for generations, eons, but, when you come down to the bottom line, we really don't understand that much about them.

AN END TO POUNDING

ROWAN SHIRKIE



A new small-scale mill in Botswana grinds out more than just flour.

The people wait patiently this morning in the yard outside the small mill building here in Kanye, an extended village of about 30 000 in southwest Botswana. Some sit on their gunny sacks or pails of grain in the strengthening morning sun, others wait in the pale shade cast by a thorn tree. A small engine clatters a steady background.

Every few minutes, a young man in a khaki shop coat darts out of the double loading doors of the mill, signals to one of the waiting people, and helps them haul their sack or bucket of grain onto a scale just by the doors. With a quick tapping of the balance slides, the grain is weighed, and then disappears into the dim interior.

A few of the curious gather by the door and peer into the centre of a strange mechanical theatre. The room is filled with noise and a fine dust that hangs like smoke in the bars of sunlight admitted through the windows. Standing closely together like a small herd of fantastic animals, four machines growl and chatter. Four people, all alike in khaki, flit about attending to the machines like overgrown secretary birds. The spectators watch as the machines devour and then spew up their grain.

There is a drop in the noise in the mill room. Moving on this signal, two women detach bags from the bottom of two long-legged cyclones, and hand them over to a waiting grain owner. The bags contain flour and bran, the products of a novel technology being introduced into villages in Botswana.

There is not much magic to grain milling . . . even less in a developing country like Botswana. But grain milling technology in Botswana could benefit millions of people in a way few other scientific endeavours are privileged to do.

PARTICULAR PROBLEMS

It begins with a peculiarity of sorghum, a food grain related to maize (corn) and millet. Sorghum ranks as the world's fifth most extensively grown crop, and is a basic food throughout Africa.

Birds and insects are also fond of sorghum. Over the centuries, sorghum has evolved a natural defense against these enemies in the form of bitter-tasting and hard to digest substances in the outer coating of its grain. Unfortunately, these polyphenols, as they are properly known, have much the same unpalatable quality for humans. For this reason, and because they give flour an often unacceptable colour, the hulls are removed from sorghum before eating.

The traditional way of dehulling sorghum is a long and laborious process. The grain must first be soaked to temper it. It is then pounded in a mortar and pestle to remove the hulls, and winnowed or washed to separate hulls and kernels. The operations are repeated several times until enough of the hulls are removed. The dehulled kernels are then spread out to dry in the sun before being pounded once again — vigorously — to produce flour-meal. In an hour, some 1–1 1/2 kg of sorghum meal can be prepared.

The resulting flour is humid and has poor keeping qualities in hot climates. To avoid waste, processing is done often and in small amounts — often daily. Women, particularly younger and better educated women, expect a better quality of life, and fewer are willing to carry out such arduous food preparation.

Consumers have thus shifted away from sorghum to maize, much of which is imported from South Africa. Maize is readily available milled and packaged in a convenient ready-to-use form. It is

also relatively cheap, thanks to subsidies protecting South African consumers in a marketing system that includes Botswana, Lesotho, and Swaziland as well. Botswana suffers the problems of a weak domestic marketing system dominated by South Africa, as well as poor transportation, and the usual uncertainties of food production due to disease, weather, insects, etc. The net result has been an increased reliance on imported foods and an unstable domestic foodgrain production, a Catch-22 of development.

GRINDING TO A BEGINNING

As part of national agricultural objectives, "the achievement of self-sufficiency in the production of basic foodstuffs," the Government of Botswana established the Botswana Agricultural Marketing Board (BAMB) early in 1974. BAMB was to manage supplies of crops such as sorghum and create a more favourable climate for farmers to produce, and consumers to buy. Because sorghum is so well suited to the country's climatic and agronomic conditions, the attempts to achieve and maintain self-sufficiency goals in grain production rest largely on improving sorghum production. A review of the foodgrain system of Botswana pointed to the lack of an acceptable, convenient, locally produced sorghum meal — at a price competitive with available maize products — as the key problem. This "log jam" problem, once removed, could start the flow of modernizing influences throughout Botswana's food grain system (see "Less waste, more food", *Reports* Vol. 7, no. 2).

In 1976, through BAMB, Botswana asked IDRC for support in setting up a pilot sorghum mill at the grain depot in the small village of Pitsane. Pitsane is centred in a major grain growing area and is on the road and rail line to the important urban areas — markets — to the north.

Drawing on experience gained in projects in Nigeria and Senegal, and the work of agricultural engineers at the Prairie Regional Laboratory (PRL) of the National Research Council of Canada (NRC) in Saskatoon, it was decided to test an innovative abrasive dehulling system at Pitsane (see box).

The experiment was a success. Operating on a continuous commercial basis, the mill produced a sorghum

flour that proved very popular. The flour was sold through merchants in the capital city of Gaborone. There was a strong, steady demand for the flour, enough to absorb all the mill's production and still not be satisfied.

The next step was to see whether the technology could be adapted to small-scale operations, appropriate to the needs and uses of producers and consumers in rural areas. The Pitsane mill was suited to a particular set of circumstances — at a large grain depot where there were sufficient stocks of grain to keep the mill operating economically to capacity, having good access by rail and road to the large, concentrated consumer markets in the cities.

Cereals are generally produced far from available milling and storage facilities in developing countries, and transportation is either very expensive or nonexistent. The prices offered for sorghum do not adequately cover the costs of transporting the grain from remote areas. Farmers with stocks of unsold grain are not likely to plant the same crop the next year. In 1975, this

*"If it was not
practical for the farmer
to go to the mill,
then the mill
must go to the
farmer."*

pattern caused sorghum production to drop to one-third of the previous year's good — but unsold — harvest. With the prevailing marketing system offering irregular and poor prices, the grains market in Botswana has remained largely "on farm". Grains are produced, processed, and consumed locally. If it was not practical for the farmer to go to the mill, then the mill must go to the farmer.

LOCAL MILLING

An important feature of the redesigned dehuller was the flexibility to economically mill smaller, individual lots of grain. Families in Botswana have grown their own sorghums for generations, keeping seed and producing the same grain harvest after harvest. They will often not accept the anonymous product of larger commercial milling, as the taste or colour is considered inferior to their accustomed food.

IDRC again entered the picture with a 2-year grant of \$80 000 to the Rural Industries Innovations Centre (RIIC), a small nonprofit organization in Kanye established to promote rural industries as a strategy for development.

A modified, more versatile dehuller was built in the RIIC workshops. It was scaled down to efficiently process quantities of grain as small as 10 kg — a size based on the average container used in rural areas, a bucket or slightly larger sack. One of the unique features was a dumping door in the bottom of the dehuller barrel that allowed all of a customer's grain to be recovered.

The Kanye dehuller exceeded the Pitsane success. The modifications made the new version even more efficient than the industrial unit at Pitsane, and it was more flexible. Introduced into the community with a "mill day" fair involving an educational puppet show, speeches, and hoopla, the mill soon caught on. Customers filled the mill-yard, as word of this new kind of pounding spread.

SMALL MAGIC

These two experimental grain milling projects are not going to change the food situation in Botswana. But they are the harbingers of change.

Established in significant numbers throughout the country, the milling system's beneficial effects could be felt the entire length of the food system. Producers would have the benefit of good prices and steady demand for their grain, consumers would have a convenient food of choice at a price they could afford.

The magic aura of advanced technology is not very apparent in grain milling. It is just a practical step toward meeting some basic human needs and improving the quality of life for people in developing countries. □

HOW IT WORKS

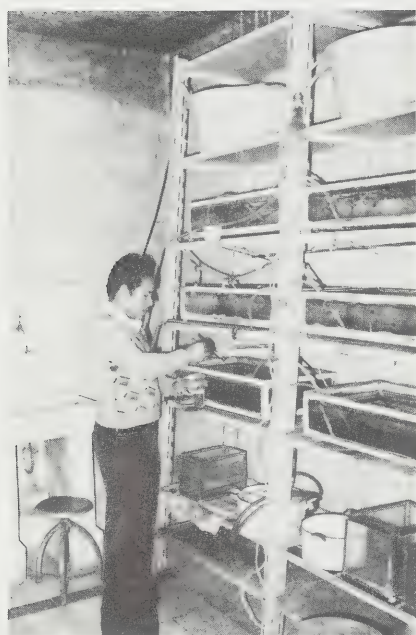
The key element of the milling system is the dehuller. Abrasive discs or stones set on a horizontal shaft rotate at high speed inside the casing. The hulls are "rubbed" off by the grinding action of the whirling stones and the friction of other grains. When grain first enters the dehuller casing it is retained for a brief period before the exit chute is opened. The rate of flow is adjusted so that the grain is kept in the casing just long enough to remove the desired amount of bran.

The bran, drawn off by a fan into a cyclone, is used for brewing beer, or as animal feed. The dehuller takes only a fraction of the time required for traditional processing, and the flour produced from mechanically dehulled sorghum has a much longer shelf life because it is dry.

The dehuller can be fabricated in developing countries, using readily available — or cheaply imported — materials, and local resources. The stones in the Kanye and Pitsane dehullers are simple Carborundum grinding wheels, the kind made for sharpening

tools.

Grain processors in developed countries had no real need to develop sorghum dehulling technologies, as sorghum was used primarily as animal feed. Sorghum milling techniques remained "trade secrets," the property of commercial firms. Researchers from the PRL adapted equipment used for a different purpose and a different grain — a commercially available barley thresher — and simplified and modified the design for dehulling sorghum, millet, and other cereals common in developing countries.



Damsissa is an herb with a difference. It produces a powerful natural pesticide that works against the snail carriers of bilharzia — a chronic, debilitating disease. The "simple powers of observation" led Egypt's Dr Mohamed El-Sawy (top) to the discovery of damsissa's unique properties. Colleague Dr M.A.R. Shahata (above) developed a breeding tank system to enable the necessary laboratory trials. At right, dried damsissa is stored at the High Institute of Public Health laboratory in Alexandria.



RESEARCH ON A SNAIL'S PACE

The snails transmitted disease. But something was killing the snails. What was it?

BOB STANLEY

The year is 1955. The young Egyptian doctor at a health clinic in the Nile Delta sees many patients every day. Half of them suffer from bilharzia, a debilitating, often deadly disease caused by a tiny parasitic worm that makes its home in the liver or large intestine of a human host.

The worm finds its way into the body through contact with water, and during its larval stage in the water uses abundant aquatic snails as hosts. Destroy the snails and you break the cycle of disease. But how?

One day, the doctor hears from a man working in the government's snail eradication program that they sometimes encounter sections of canal where there are, inexplicably, no snails. Curious, he takes samples of mud and plants from one such area, and at home begins to test them.

"To my astonishment I found that when a certain herb was present the snails committed suicide by doing what I now call 'the dance of death'. The snail tries to come right out of its shell, and twists around so violently that blood oozes out. Soon they die."

He repeats the experiment many times. Each time the result is the same "dance of death". The plant he is using is a common wild herb called damsissa (scientific name *Ambrosia maritima*) found in much of Egypt, Sudan, and the Mediterranean countries.

Now very excited, the young doctor tries to interest someone in his discovery. He even writes to the President. His only response is a stern reprimand from the Ministry of Health reminding him that he is a doctor, not a researcher, and telling him to stop wasting his time with snails and get on with the business of doctoring.

More than 25 years have since passed, and Dr Mohamed El-Sawy is no longer a young man. But he is a researcher. In fact, he is Chairman of the Department of Tropical Public Health at the University of Alexandria.

Dr El-Sawy persisted. He became a researcher, studied both in Egypt and in the United States, and published his early findings on the damsissa plant. Today he says: "I thank God that after

25 years we have been able to introduce a method that is feasible, inexpensive, handy, and safe to combat the snails."

DETECTIVE WORK

A short, portly figure in a conservative suit, rimmed glasses, and walking with the aid of a sturdy cane, Dr El-Sawy today resembles nothing more than one of Agatha Christie's cerebral detectives. Which perhaps is as it should be, for a great deal of his research is based on detective work, or as the doctor prefers to say, "the simple powers of observation".

In this case, nowhere are the clues more prolific than in the folklore of Egypt itself. Dr El-Sawy gives a few examples: there is a saying in Egypt, even today, that the best workers, the strongest men, come from Upper Egypt. Why? Because until quite recently there was very little bilharzia among those people. And why was that? Because until the construction of the High Dam at Aswan there was no perennial irrigation. Water collected in basins during the spring flood, and once it was used, the canals simply dried out. Snails cannot live under such conditions. But surely some snails must survive in the permanent waterways? True, in Upper Egypt the traditional houses were built of mud bricks, and it was always said that the best mud was to be found wherever the damsissa plant grew. The local name for the *Bulinus truncatus* snail (a carrier of bilharzia) literally translated means "destroyer of homes".

Dr El-Sawy believes that there is often a great deal more to folklore than meets the casual eye, and that modern medicine can learn a great deal by paying closer attention to some of the old tales and traditions. The house builders of Upper Egypt may not have fully understood the direct relationship between the snails and the damsissa plant, but they knew from generations of observation that where the plant grew there would be no snails.

BREAKING THE CYCLE

The doctor's early laboratory experiments with damsissa had yielded prom-

WHAT'S IN A NAME?

Theodor Maximilian Bilharz, a German physician and zoologist, went to Egypt at the age of 25. It was here, while working as professor of descriptive anatomy at the Cairo Medical School, that he first observed the disease. In a series of letters to his old zoology teacher between 1851 and 1853 he described the disease in detail and identified the previously unknown parasitic worm — complete with drawings of the worms and their eggs. The name bilharzia was formally introduced into the scientific nomenclature in 1856, some years before schistosomiasis was also accepted.

Oddly enough, Bilharz himself never considered his discovery to be as important as his research in zoology. Natural history remained his first love, and it was this that led him to accompany a fellow German explorer on an expedition to Ethiopia in 1862. There he contracted typhoid fever while treating a patient. Although he was rushed back to Cairo, he died a few days after his return, just 37 years old.

ising results. Infusions of 1:1000 proved lethal for the snails and their eggs, and remained potent in the water for up to 48 hours. As a bonus, the solution was also found to destroy 90 percent of the parasite schistosome eggs, which, if hatched, would produce the free-swimming larvae (known as *cercariae*) that can penetrate the skin of an unwary wader. Once established in a human host the *cercariae* grow to maturity, and multiply — the female adult schistosome worm has been described as "an egg-laying machine". Inevitably some of the eggs find their way back into the waterways thus perpetuating the cycle of infection. But now it seemed that Dr El-Sawy and his colleagues had found a way of breaking into that cycle without the use of expensive chemical molluscicides that pollute the waters and kill fish.

The herb kills the snail vectors of bilharzia, but appears to be harmless to fish, other plants, or humans.

The need is great. In spite of enormous efforts to eradicate it, the disease still affects an estimated 200 million people in the tropical countries of the developing world. The cost is incalculable, whether in terms of human suffering, or of direct economic values such as the cost of treatment and control programs and loss of productivity in the infected workforce. Worse, it reduces the benefits of costly large-scale irrigation schemes such as those resulting from the construction of Egypt's Aswan High Dam or Ghana's Volta Lake dam.

In Upper Egypt, says Dr El-Sawy, a 1937 survey showed the incidence of bilharzia among the population to be between 0.5 and 3.5 percent. Three years after the High Dam permitted perennial irrigation in the region, the level had risen to 75 percent. Because the dam prevents the annual flood waters "flushing out" the Nile, even the great river itself has become infested.

The only solution, Dr El-Sawy believes, is to reduce the snail population to the point where the infection cycle is broken. This must be combined, he says, with a cheap, effective treatment, and a public education program to prevent further contamination of the waterways. Only then will the disease cease to be endemic.

FIELD TESTING

The laboratories of the Department of Tropical Public Health are on the top level of the High Institute of Public Health in Alexandria, and have even overflowed on to the rooftop. Much of the equipment is old and dilapidated.

The stairways and halls throng with people, most of whom seem to know the doctor, and greet him with respect and affection as he passes. Progress is slow as he is frequently stopped by colleagues or students seeking advice or assistance.

Even on the rooftop the interruptions continue as the doctor shows the visitors his domain. There is a simple gravity-fed system devised by one of his team, Dr Shahata, for breeding snails without the necessity for electric-powered aeration pumps. Further along the roof is the animal section, where literally thousands of experimental animals are bred and kept, so successfully that they are able to supply other university departments with the animals they need. And there is a room full of dried damsissa and sacks of seeds. Dr El-Sawy explains that last year he ran out of seed and was unable to supply the farmers who wanted to plant the herb alongside their irrigation canals.

In 1977, IDRC provided a grant to cover about 40 percent of the cost of a 2-year program of field-testing. Earlier tests in the field had demonstrated that the plant indeed killed all the snails in a short section of canal and did no harm to the fish, but they were carried out on a very limited scale using only dried damsissa. For this project the researchers selected a village of some 500 people on reclaimed coastal land near Alexandria. A similar village was selected as a control. After a thorough survey of both the human and the snail population of the region, the purpose of the project was explained to the people: to test the effectiveness of

green damsissa as a natural molluscicide.

The response was enthusiastic. The villagers helped to seed the banks of every canal and drain in the vicinity. One farmer donated a small plot of land to be used to cultivate damsissa and collect the seeds. By happy coincidence, the summer flowering of the plant coincides with the natural peak of the snail population. It is also the time of the school break, so there was no shortage of young helpers to spread the flowers and leaves on the canals.

The research team visits both villages regularly, looking for symptoms of bilharzia, and recording the incidence of the disease. A count of the snail populations is taken every three months. In the project village monthly meetings are held, stressing improved sanitation and community involvement to prevent reinfection of the waters.

On one such visit, the project's microbus is surrounded the moment it reaches the village by people wanting to speak with Dr El-Sawy and his colleague, Dr Hassan Bassioumy, the team's physician. The people are pleased with the project, explains Dr El-Sawy, there are no snails now — a fact that is demonstrated when repeated sweeps with a net in several canals produce only empty shells.

Dr El-Sawy is now preparing a report of his findings for publication in the scientific literature. He has tentatively entitled it "Bilharzia: the problem and the solution", although he admits that may be just a little premature. Further large-scale testing of the damsissa plant will be needed to test its adaptability to different climatic zones. Agro-nomic studies are needed, because the plant usually grows wild and its cultivation has never been studied. The doctor speculates it might even be possible to develop an underwater variety that might eliminate the snails permanently. "There is still much work to be done," concedes Dr El-Sawy.

Back in his office, the desk is piled high with papers — a 6-volume thesis awaiting his attention, rolls of plans showing the project village and its waterways, and drawings of snails for his report. Against the walls are two grey metal tables, a broken chair propped carefully against one of them. The doctor rises to wash his hands at a small, stained sink. The tap coughs fitfully but declines to produce water. As he sits down and reaches for the first volume of the thesis, the lights go out momentarily, then flicker back to life. Dr El-Sawy allows himself a small smile. "What I would like," he says, "is to make a new laboratory for the young scientists."



No live snails are netted in sweeps of a canal "treated" with damsissa grown along its banks.

DEAR AIMÉE

Someone to answer your questions about Africa.

JEAN-MARC FLEURY

No matter who you are, or wherever you may be, if you want to know more about Africa, its philosophers, its cooperative agencies, or even how to raise rabbits there, there is someone ready to help you. Her name is Aimée Adou, and she lives in Abidjan in the Ivory Coast.

All kinds of people write to Aimée. An elementary-school pupil asked her "What is dirt made of?" A teacher wanted information on building a pigpen and raising pigs. Many of those who write are teachers and students — but there are also mechanics, postmen, and farmers.

Last year Aimée answered 211 letters from 17 African countries and several western nations. Many African students in Europe also wrote to her.

When the questions are clear and to the point she replies the same day. But some letters require more research; for example, that of a teacher from Togo who asked "Could you provide me with a list of African authors and philosophers and the titles of a few of their works?" Aimée's reply consisted of photocopies of documents, a page of bibliographical references, and eleven solid pages of names of African philosophers and their works. Some questions might call for whole theses in answer.

Most of the questions deal with some aspect of individual or collective development and Aimée tries to provide prompt, practical answers. Sometimes, however, the letters contain very tricky questions, such as one received the day of our visit, which read as follows: "Of the United States and the USSR, whose policies are appreciated more in Africa, and why?"

As you may have guessed, Aimée Adou does not have all the answers herself. She is a member of the Permanent Question/Answer Service team, part of the African Institute for Economic and Social Development (INADES) in Abidjan. When the service was created, with the aid of funds from (IDRC), INADES wanted to make available to *everyone*, not just to researchers and academics, the vast resources of its library, one of the richest stores of information on Africa in all of francophone Africa.

Even before the service was created in 1977, INADES received some 50 requests a year for information. When it realized the lack of readily available information about Africa, the Institute sought to provide an information

service accessible to anyone who could write a letter.

"The service is an experiment," says Mr E. de Rosny, Director of INADES, "intended to encourage people to write down their questions. Everyone agrees that African society has always been one of communication," he explains, "but oral communication is no longer enough. Hence, the importance of the transition from oral to written expression. There are many ways of doing this: school is the most obvious. The information service makes another modest contribution."

At INADES it is hoped that this transition from speaking to writing will be done in a human way. In school, people are obliged to learn to write, but this service gives people the opportunity to willingly use their new skills. "The unemployed worker in Treichville (a part of Abidjan), who one day picks up his pen to ask us how to become an electrician: that man has made the transition to the modern world," says Mr de Rosny.

Unemployed, civil servant, or scholar, all will find through the service someone ready to help them plug into the knowledge needed for informed action. With Aimée there are Jeannette M'Bengue, a specialist in agricultural information, and Nicole Vial, the service's Director. They can also rely on the assistance of the INADES librarians, researchers, and

secretaries.

The service team also provides rural project leaders with suitcases of books on agriculture, history, or health, along with novels and magazines to be read just for fun. About a dozen of these small suitcase libraries crisscross Africa. Last January, ten were in circulation.

Theoretically, anyone who can write a letter can use the service, but first people must be aware that it exists. This is the main challenge facing the team: making themselves known. So far magazines, newspapers, and radio stations have agreed to publicize the service. A magazine has undertaken to publish two sample questions and answers on a regular basis. But a great many more people must be reached if the service is to function as it should.

The extraordinary thing about a medium such as the Permanent Question/Answer Service is that the questions themselves contribute to the quality and efficiency of the service. Aimée keeps a record of each question received and is gradually assembling a bank of information on those most often asked, anticipating areas of popular interest. Thus, your letter will be useful not only to you but to many other clients.

Any more questions? Ask Aimée!

Oh yes, her address is SPQR, INADES/Documentation, B.P. 8008, Abidjan, Ivory Coast. □



Aimée Adou with one of the "suitcase libraries" serving West Africa.

TWO APPROACHES TO HEALTH

Health for all by the year 2000 is the current rallying cry of the World Health Organization (WHO). Adopted by the 30th World Health Assembly in 1977, it is intended to draw attention to the vast health problems that still exist throughout the world, and to make improved health the main social target of governments in the next two decades.

It's a catchy slogan, but what does it really mean? What it definitely does *not* mean, according to Dr Halfdan Mahler, Director-General of WHO, is "medical repairs by doctors and nurses for everybody in the world for all their existing ailments in much the same way as mechanics repair faulty motor cars." Nor, says Dr Mahler, does it mean that nobody will be sick or disabled.

"It means a different approach, by which health is considered in the broader context of social and economic development. It means that people will use better methods than they use now for preventing disease and alleviating unavoidable disease and disability, and better ways of growing up, growing old, and dying

gracefully."

And that, says Dr Mahler, means primary health care — avoiding the kind of "medical consumer society" that exists in the developed countries, and instead training health workers to be socially attuned to the needs of the people they serve.

Two books that deal with very different aspects of just that kind of health care have just been published by the IDRC

Rural health care in Egypt looks at the content and structure of both the formal and the informal health services in rural Egypt, and examines how the two complex systems coexist.

Author Nawal El Messiri Nadim, a faculty member of the American University of Cairo, interviewed 10 health practitioners in four villages. Research staff lived in the villages for three months in order to obtain detailed observations of their subjects, and even attended several deliveries with village midwives.

The 40-page illustrated booklet provides a fascinating insight into the roles of the various types of health practitioners, including the *daya*

(traditional midwife), the *hakima* (licensed nurse) and the three types of barbers who practice some form of health care. Above all the book points out that any attempt to introduce innovations in health care in the villages must take account of the existing intricate web of relationships among the various groups of health practitioners, and the attitudes and desires of the people themselves.

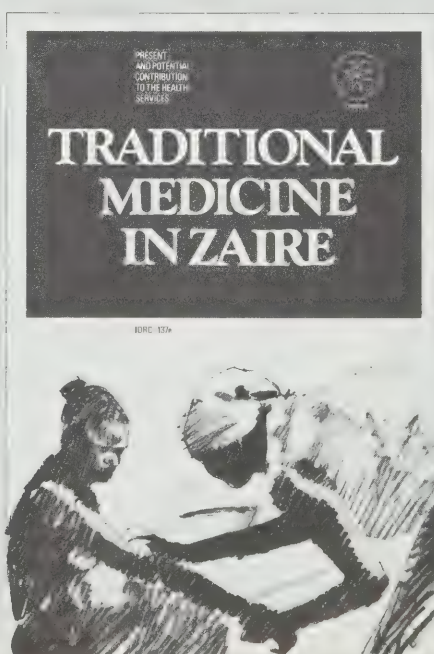
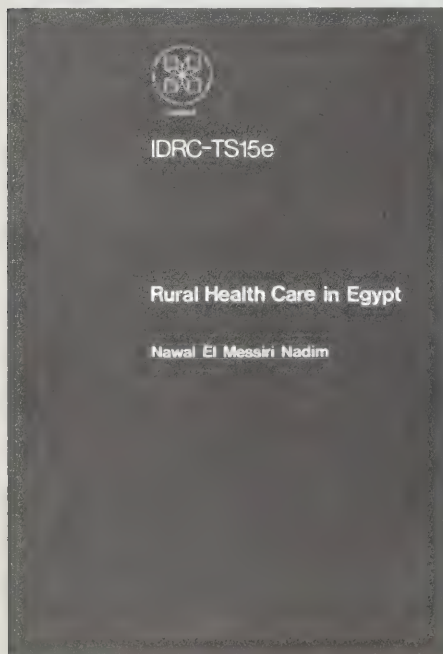
Traditional medicine in Zaire is a somewhat more formal study of the potential contribution to the national health services that could be made by Zaire's extensive system of traditional healers. The report is based on the results of a 3-year project carried out by the Healers' Medicine Centre in Zaire with the support of an IDRC grant.

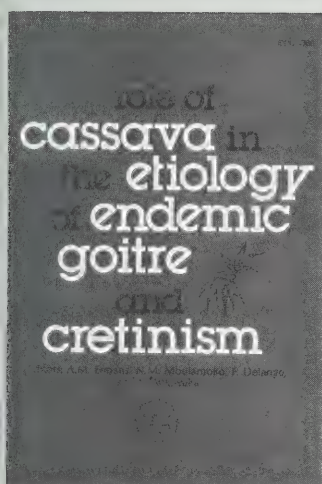
It begins by examining the present situation of traditional medicine in Zaire. In the words of the authors: "We approached traditional medicine through a study of the healers for the same reason that a study of Western medicine might use physicians as a starting point." And they conclude that traditional medicine is "dynamic, evolving in every aspect to cope with today's society."

The second segment of the report provides some suggestions as to how this "dynamism and vitality" can be used as a basis for developing a new integrated system of health care in Zaire.

Both books, in addition to making intriguing reading, challenge many of the preconceived notions still held by many health professionals, especially those trained in the West, about the role of traditional health workers. Some of the ideas presented will undoubtedly not sit well with the medical establishment. Yet there is no denying that traditional healers, whatever their limitations, do play a substantial role in health care in many developing countries.

If Dr Mahler's dream of health care for all by the year 2000 is to be realized, then every avenue must be explored. For that reason alone, these two booklets are well worth reading, and their ideas worth considering. □





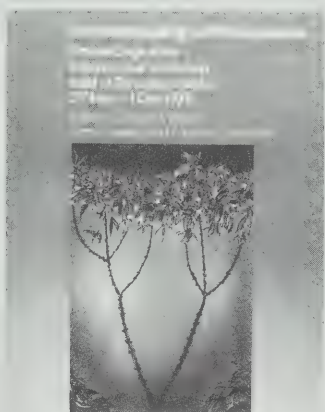
Role of cassava in the etiology of endemic goitre and cretinism, A.M. Ermans, N.M. Mbulamoko, F. Delange, and R. Ahluwalia, editors. Published in March 1980, 182 pages, IDRC-136e.

This monograph summarizes a series of clinical and experimental studies that have established that goitre and cretinism in Central Africa are caused by the joint effects of iodine deficiency and a goitrogen found in cassava. It is suggested that greater emphasis be placed on the development of new varieties of cassava with minimal amounts of the goitrogen.

Acronyms relating to international development/Liste de sigles en développement international/Siglas relacionadas con desarrollo internacional, compiled by Margaret Carroll. Published in March 1980, 162 pages, IDRC-138e,f,s.

A trilingual (English, French, Spanish) compilation of the acronyms of institutions and projects appearing in the language of international development, this publication is intended as an aid to identify their complete names and locations.

Intercropping with cassava: proceedings of an international workshop held at Trivandrum, India, 27 Nov-1 Dec 1978, Edward Weber, Barry Nestel, and Marilyn Campbell, editors. Published in January 1980, 144 pages, IDRC-142e.

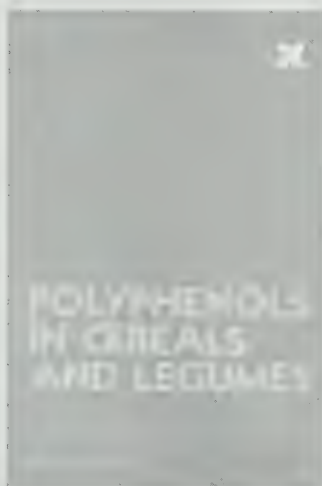


The proceedings of a workshop, this is the 15th of the IDRC cassava monograph series. The 14 papers and summary of discussions review past and ongoing research on multiple cropping systems that include cassava, and suggest guidelines for future research. A bibliography and list of participants are included.

Polyphenols in cereals and legumes: proceedings of a symposium held during the 36th annual meeting of the Institute of Food Technologists, St. Louis, Missouri, 10-13 June 1979, Joseph H. Hulse, editor. Published in January 1980, 72 pages, IDRC-145e.

This publication presents the proceedings of a symposium held to review the state of knowledge, and recommend further research on polyphenols. Seven presentations

review the structure and biosynthesis of polyphenols, their nutritional role, biochemical effects, and related topics.



Importance et ambivalence de la migration voltaïque. Tome I. Les migrations voltaïques, Sidiki Coulibaly, Joel Gregory et Victor Piché. Published in March 1980, 144 pages, IDRC-147f. (French only)

This publication, volume one in a nine-volume study, gives an overview and summary of data collected in the National Survey of Migratory Movements in Upper Volta in 1974-1975. Two major themes emerge: the importance of the population movements; and the ambivalent way migration is perceived by the Upper Voltans.

Dissemination of scientific information in the People's Republic of China, Kieran P. Broadbent. Published in March 1980, 60 pages, IDRC-148e.

This monograph gives a first-hand account, gathered during a trip to the PRC in April 1979, of the present applications of computer technology in China, and examines the ways in which the problems faced in the conversion of Chinese

script to a machine-readable format are being handled there.

Searching: review of IDRC activities 1979.

Published in March 1980, 40 pages, IDRC-150e.

A non-technical review of the work of IDRC during 1979, this publication places research for development in perspective for a general reader. Highlighted are multiple cropping, aquaculture, and food systems; international cooperation in information sciences, and innovations in information management; human migrations and settlements, and delivery of mass education; water supply and sanitation, and tropical disease. (Also available in French and Spanish editions.)

An end to pounding: a new mechanical flour milling system in use in Africa, Paul Eastman. Published in April 1980, 64 pages, IDRC-152e.

Of interest to a wide audience, and particularly to those who elaborate agricultural and industrial policy, owners of small-scale industries and cereal technologists, this monograph describes a novel milling system for cereal grains and legumes common to the semi-arid tropics.

Tropical oysters: culture and methods, D.B. Quayle. Published in March 1980, 80 pages, IDRC-TS17e.

The basics of oyster culture are described in this manual, intended for use by both researchers and field personnel. Contents cover biology and breeding, culture, feeding, harvesting, and equipment needs.



INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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Reports

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**Cassava
Research**



CANADA

LETTERS

Poor city

Your article, *The poor create tomorrow's cities* (December 1979), was a welcome update on self-help housing. I was particularly interested in the Tondo discussion. Five years ago there was the International Design Competition for the Urban Environment of Developing Countries, focusing on Tondo. The design solutions were presented at Habitat 76 in Vancouver. One parameter of that competition was that 100 000 Tondo residents would be relocated by stages to a new site several kilometres away. Architectural designs were formulated on that basis.

Now, I see, things have changed. According to your article only 22 000 residents are to be relocated and Tondo is to be upgraded, on site, with most residents remaining. Studies of urban slum immigration in developing nations have indicated that "in place" improvement is probably going to be more successful than wholesale relocation. I am encouraged to learn of such an approach being tried in Tondo.

To migrate to an urban slum in search of work and a better life is an act of commitment. It is more likely that these immigrants are interested in protecting and building upon that commitment, right where they are, than they are in relocating to less certain social and logistical locations. The recent urban slums of developing nations harbour a giant built-in will toward upgrading. Material, monetary, or technical aid, however small, is apt to be put toward a better environment provided that it does not threaten the small physical comforts or social

comforts already achieved. I hope that your *Reports* will be monitoring similar efforts in the future.

George L. Coates
Berkeley, California, USA

About seeds

The answer to the actual question of whether seeds can be patented (April 1980) is very simple. Yes, seeds can be patented. They already are in industrial countries, and this increasingly will become the case in other countries of the world.

However, an underlying question — one that I would like to answer in more depth — is, "Who owns a new variety?" Here it must be said that this depends on the type of owner, and ask further, "Who owns plant resources?" It is easy, and even appropriate, to answer that plant resources belong to everyone. The corollary to this statement, however, is that everyone must also invest in plant breeding research. At the moment, only certain specific agencies invest in research to produce new varieties. It follows that these agencies need to replenish their coffers on a regular basis. Private companies do this by means of a levy at source, that is, on each pound of certified seed sold. Public agencies do it through sociopolitical manoeuvring, that is, they levy taxes to finance research and then boast of giving varieties to all the producers. Between these two kinds of agencies, there are various "hybrids" that act in more than one capacity.

There are three main types of owners of new varieties. In Canada, the Ciba Geigy company produced Mingo barley through a double-haploid technique. It certainly

plans to recover its investment. As it is the "owner" of both the research and the cultivar, I recognize its ownership of Mingo barley. The experimental farm in Brandon, Manitoba, belongs to Agriculture Canada, and through its research has produced several notable strains of barley, including Conquest and Bonanza. Here, it is more difficult to identify the owner, except that the variety is public and is distributed to all recognized seed producers. On the other hand, the person responsible for increasing — or rather for not reducing — research spending is the manager of this research at Agriculture Canada. He weighs the factors of basic and applied research, while the politician considers the overall Agriculture Canada research budget. Lastly — and these are our "hybrids" — the universities are called upon to help both industry and governments, and they produce varieties that are sometimes private, sometimes public, and sometimes neither one nor the other.

By way of conclusion, it seems to me that the owner of a new variety must own the research funds, so as to ensure a stable and sustained income for the necessarily long-term plant breeding research. All that is necessary is to adopt a formula that will ensure this development.

Claude-André
St-Pierre
Laval University
Quebec, Canada

More seeds

There are some comments I would like to make on the article *Seeds: patent pending*. In particular, I would point out that the Ranks Hovis

McDougall takeover story is quite wrong although often quoted since Mr Mooney wrote it. I told Mr Mooney in a public meeting in Regina in March 1979 that the story was wrong. Subsequently, he republished the story in *Seeds of the earth* and attributed it to me!

The facts about Ranks Hovis McDougall (RHM) are that they are a large flour milling company. In the early 1960s (before the British Plant Breeders' Rights Act of 1964) they purchased about 80 local grain companies. Nine of these grain companies were in the seed business locally and RHM set up a national seed company. However, RHM say that the Plant Breeders' Rights Act had no bearing on this and I believe them since they do not own nor have owned any proprietary varieties.

I would also add that Dr Anderson is not correct in saying others could protect CIMMYT varieties. Only the breeder or his lawful successor may apply for rights. I think your article does attempt a balanced approach but I wonder whether you have shown why it is that the authorities in the developed countries have adopted Plant Breeders' Rights law. In all cases, if you were to inquire, I believe you would be told that the intention had been to stimulate the flow of improved varieties and that this objective is being met.

W.T. Bradnock
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Agriculture Canada
Ottawa, Canada

Letters from readers are welcomed, and should be addressed to:

*Editors, IDRC Reports,
PO Box 8500, Ottawa,
Canada K1G 3H9.*

Reports

THE IDRC

The IDRC Reports and companion editions *Le CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michelle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feterbaum. *Staff photographer*: Neill McKee.

CONTENTS

Letters		2
Cassava research: a return to the roots	Barry Nestel talks about the research program built up around cassava over the last ten years.	4
The artful science	Send an insect to catch an insect. Michelle Hibler writes on the biological control of cassava pests.	6
Message to agronomists	Jean-Marc Fleury relays a caution from a physician — cassava may trigger serious health problems.	8
Finance officers — partners of research	The people who manage the money for research projects deserve some credit, Bob Stanley discovers.	11
Briefs	A quick scan of news and trends in development.	13
One room, one school	A photofeature on old-style education made new again.	14
Survival on the Brandt plan	The Brandt Commission on development issues hands the world a new program for survival. Rowan Shirkie reports.	16
Commentary Aid as obstacle	Conventional development assistance defeats its own purpose, say Frances Moore Lappé, Joseph Collins, and David Kinley.	18
Small and medium can be beautiful	Small enterprises promise growth with equity in developing countries. A.T.R. Rahman outlines a strategy.	20
Farmer-to-farmer communication	Cassette tape recorders open up new lines of communication in rural Uruguay. Susana Amaya explains.	24
New releases	Recent IDRC films and publications.	26



Cover Cassava and sweet potatoes at Malang market, East Java, Indonesia. Although the staple of millions in Africa, Asia, and Latin America, cassava was ignored in crop improvement programs. Times have changed. Three articles in this issue of Reports illustrate how.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia

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CASSAVA RESEARCH

A RETURN TO THE ROOTS

An interview with Barry Nestel on the cassava research network

Cassava. This drought-resistant root crop is the major staple of some 300 million people around the world. Yet, until 1971 and the start of the CIDA/IDRC program, it had been largely neglected by research.

Barry Nestel, formerly Associate Director of the Centre's Agriculture, Food and Nutrition Sciences Division, was responsible for the IDRC cassava program during its first seven years and, as consultant to the program, he remains very much interested in the crop's progress. He recently talked with Clyde Sanger at his home in Surrey, England.

Reports: How did the cassava program begin?

Nestel: "The program arose in 1970, I suppose out of the fact that, in 1969, CIDA (Canadian International Development Agency) put a proposition to the government for support for the two international centres — the wheat and maize one, CIMMYT (International Maize and Wheat Improvement Centre), in Mexico and the rice one, IRRI (International Rice Research Institute), in the Philippines. The concept of Canada supporting developing countries to increase their production of cereals was not particularly well received in some wheat-producing quarters in Canada and both propositions were turned down.

"At about this time, the Pearson report came out. Mr Pearson (the Right Hon. Lester B. Pearson, former Prime Minister of Canada) became the first chairman of IDRC, and CIDA decided that Canadian aid through research would be handled through IDRC. All of these factors linked up with a renewed CIDA interest in agricultural research. As a result, CIDA decided it would provide financial support for two new international agricultural research centres — CIAT (International Centre for Tropical Agriculture) in Colombia, and IITA (International Institute of Tropical Agriculture) in Nigeria.

"For IITA, it decided to give a block grant of \$500 000 a year. For CIAT, it decided to pick one commodity. This was quite important because CIAT served as a regional centre for CIMMYT and IRRI, and had maize and rice programs. It wanted to divorce the Canadian aid from these, so it was decided to support a different commodity, cassava. Although it is a well-known crop in the tropics, it had never received much research input because it's a basic, staple food crop of poor farmers, it's

highly perishable so it won't transport, and it's not particularly palatable to western palates."

Reports: How did IDRC become involved?

Nestel: "CIDA asked IDRC to subcontract the management of the financial support because, unlike most aid grants, they put some strings on this one. One was that, in addition to giving CIAT \$500 000 over a five-year period, they would put \$750 000 into Canadian institutions for back-up research. Clearly, the two had to be very closely tied in and this would require a managing agent for the funds. They also suggested that IDRC should be advised by a committee.

"When I was first asked to be responsible for managing the CIDA money, in 1970, IDRC was prepared to match the CIDA funding of \$750 000 by a similar sum of money given as grants for programs to form linkages in other countries. However, we had to have the program underway at CIAT before we could develop these linkages, since most of the developing country programs involved training components at CIAT and testing CIAT-type technology. The first thing was to get the CIAT program going and identify where basic research support in Canada fitted in. Then we moved on, after about two years, to the developing-country program."

Reports: What were the first steps?

Nestel: "The first thing we decided to do was to identify what had already been learnt about the crop and who were the people who knew something about it. We found that although there

were about 3000 literature references to the crop, only 20 or 30 were of scientific value.

"We were able to pick out the names of living people who had done work on cassava. Most of them were retired or on the point of retiring, and had done their work on the crop prior to World War II. In conjunction with CIAT, we invited some two dozen people — virtually our whole list — to a three-day workshop. So we had a brainstorming session right at the start of the program. We also used this to identify a group of five or six people to act as an advisory committee.

"We did move on two other fronts very early on. We started a dialogue with CIAT on collecting the world literature on cassava. IDRC gave CIAT a grant for this purpose. They also worked on methods of disseminating the information, and, in fact, set up the Cassava Information Centre that both collects and distributes books, monographs, directories of workers, and so forth.

"This is quite important — I did a survey last year that showed that the last 300 articles on cassava appeared in something like 130 different journals. So this service enables someone like me to keep right on top of the literature with an absolute minimum amount of reading.

"The third thing we got off very early is that we decided there wasn't a great deal of point in pushing a crop unless there was a market for it. In fact, one of the reasons why Howard Steppler — then agricultural advisor to CIDA and the one who was really responsible for the program — became interested in cassava was that during the 1960s cassava took off in Thailand and Indonesia because the Germans and the Dutch, who were short of animal feed — energy feeds — found they could substitute dried cassava for cereal grains that were much higher priced.

"So we had a lead, and we knew that cassava produced more energy per acre per year than any other crop except sugarcane. In drier areas, it out-produced sugarcane. And as sugarcane has had 100 years of intensive research input, the feeling was that we had here a potential energy source, something that produced starch, and this could be the starting point for various industrial uses."

Reports: What were cassava's prospects?

Nestel: "The market study, which was

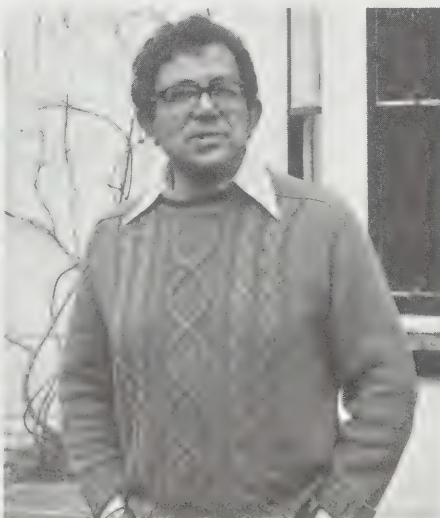


Photo: Clyde Sanger

Barry Nestel

done by Dr Truman Philips of Guelph, indicated that, in the animal feed market alone, the prospects for expansion in Europe alone appear very promising without taking into account Japan or the developing countries. The starch market did not have particularly attractive growth potential because cassava starch can be substituted with corn and potato starch. And, based largely on FAO predictions, the prospects of growth as food were quite limited because as people's economic status improved, they tended to go for cereals rather than root crops."

Reports: What has happened since?

Nestel: "In brief, the CIAT program has developed from a one-man operation to a professional team of about 12 that sees as its prime goal the development of high-yielding varieties of cassava widely adapted to a large range of ecological conditions. They're producing a wide range of germplasm, screening it, and putting the most promising into international testing trials in 30 or 40 different countries. The second major role is using their superb training facilities to train people from client countries in all aspects of the program."

"The Canadian program, which grew to a little bit over \$1 million, is now phased out. By all accounts, it appears to have been very successful: we had over 20 different programs looking at specific problems where there was a comparative advantage of doing work in Canada rather than in developing countries. An outstanding example was a technique developed at the National Research Council's Prairie Regional laboratory in Saskatoon to grow cassava in test tube tissue culture (see box page 10).

"The third part of the program is the IDRC support for national programs which, in the main, has tried to help national aspirations to set up this sort of team approach which, to some degree, CIAT pioneered."

"The IITA cassava program is much smaller than CIAT's. They work particularly on trying to produce plants resistant to mosaic." (see page 10)

Reports: Can you tell us about some of the results?

Nestel: "I think probably the prime accomplishment has been in terms of developing research teams in cassava-producing countries. When we talk about accomplishments in terms of high yields, I think IITA's highest yield is around 70 tonnes per hectare and CIAT's a little higher — typical farm yields are in the order of about 12 tonnes per hectare."

"One of the programs at Guelph was to use cassava starch as the substrate for growing microorganisms rich in protein. This has been

very successful experimentally and has moved down to CIAT on a pilot scale, to provide enough feed for about 40 pigs. To actually put it into commercial practice now would entail some type of commercial enterprise taking it on."

"The other side of this was the work that started in Colombia before the program began — feeding cassava roots to pigs. We have supported a number of projects, particularly in Thailand, Malaysia, and Nigeria, just to look at the economics and system of using cassava in place of cereals for poultry, pig, and cattle feed. With appropriate processing and supplementation, you can substitute it entirely for corn in broilers and pigs."

"There is a team at Khon Kaen University in Thailand that has done a superb job of looking at cassava from 20 or 30 different suppliers on a weekly basis throughout the year, and mapping the range in chemical composition and correlating the chemical value with the biological value. At the same time, there is a team at the Asian Institute of Technology in Bangkok that looked at the drying and pelleting process."

Reports: Are there other significant aspects to the program?

Nestel: "Brawijaya University in Eastern Java had a project for five years for IDRC working on Mukibat cassava — a tree cassava grafted on the root of ordinary cassava. They've found out a great deal about the process: the grafting is very labour-intensive, and so is getting the roots up! A big root from one plant can weigh up to 100 kilos — it takes three or four men half a day to dig

it up. I'm not sure what commercial application it has, but I think the fact that the farmers themselves developed and use this process very extensively shows that it has practical application."

"This project illustrates another rather exciting feature of the whole network — the extent to which we have been able to work with other people. Brawijaya is one of the universities Australia has singled out for particular help in the Australian-Asian University Program. People in the program are coming back from Australia much better trained, and our grant has enabled them to get their teeth into something when they get back."

Reports: Where is the program now headed?

Nestel: "We started something that is largely self-sustaining now. CIAT funds come through the World Bank Consultative Group on International Agricultural Research without any problems. More and more aid donors are getting involved in supporting national programs. We helped create a lot of national teams."

"The two things that we should try to continue are: first, getting small programs in African countries that have very limited research resources. Secondly, maintain our interest through keeping going the workshops that bring together people from around the world to look at problems, particularly since they have led to a series of very widely-accepted publications.[†] Every eight or nine months we have had a workshop to look at a particular problem area. We've used these workshops very extensively to identify research that we should support and where it might be done."

"There is still scope, but the large inputs into Latin America and Southeast Asia should now phase down and out."

Reports: What has been most satisfying for you?

Nestel: "I think the most satisfying thing has been the relationships with people. You've only got to visit one of the countries where we're involved, and you're whipped into a car to see their latest stuff. The enthusiasm, the satisfaction of seeing it, the spirit! The network involves 30 or 40 countries and 400 or 500 people. It pulls together as a team. People exchange results and it's a very friendly group to work with." □



Cassava variety trials in Sri Lanka: "... probably the prime accomplishment has been in terms of developing research teams in cassava-producing countries."

[†] IDRC has published 17 monographs dealing with various facets of the cassava research program. For information, write IDRC, Communications Division, P.O. Box 8500, Ottawa, Canada K1G 3H9

Biological control methods do not carry the threat of pollution or environmental damage, but they do require much painstaking research. Right, Dr. M. Yaseen searches for cassava mites — and, hopefully, their enemies. Below, Dr Fred Bennett and a student examine young cassava plants in an experimental plot in Curepe, Trinidad.



MICHELLE HIBLER

THE ARTFUL SCIENCE

Turning one insect against another to protect crops demands the knowledge of science, the skill of art



A lot of people refer to biological control as an art rather than a science", says Dr Fred D. Bennett, Director of the Commonwealth Institute of Biological Control (CIBC) in Curepe, Trinidad. And certainly, with biological control of crop pests, you can't apply any hard and fast rules: the means — predators or parasites — vary according to geographical location and the insect to be controlled; the certainty and degree of control is variable; the methods may take years to become fully effective.

But the method offers many advantages. First is its economy and permanence: once natural enemies against a pest are established, the pests are kept in check without further effort or expense. Biological control methods do not carry the threat of pollution or environmental damage and, unlike chemical pesticides, require almost no energy to produce.

On the other hand, biological control methods can pose risks. If the wrong parasites or predators are introduced, they may attack beneficial insects, or even, in the case of biological weed control, cause severe damage to crops.

In some cases, biological methods may be the only practical means of pest control. Controlling cassava mites and mealybugs in Africa is a case in point. Because of cassava's long growing period — more than a year — and because it is grown mainly as a subsistence crop, chemical control of its pests is unlikely to be practicable. In some areas of the People's Republic of the Congo and Zaire, where young cassava leaves are an important source of food protein, toxic pesticides could also pose too great a risk to health.

Because of cassava's importance as a staple food, or as a famine crop that ensures survival when the local staple fails, governments have become increasingly concerned about the loss of crops. In recent years, Uganda, northern Tanzania, and Zanzibar reported yield losses of up to 50 percent or higher due to infestations of the green cassava spider mite (*Mononychellus tanajoa* Bondar) (see box).

THE MIGHTY MITE

The green mite was introduced to Africa from South America by human misadventure, having crossed the ocean in illegally imported cassava cuttings in the early 1970s. Severe infestations were first reported near Kampala, Uganda, in 1972. A year later, much of the country was infested, and the mite made its way, or was carried, to northern Tanzania and eastern Kenya. Dangling on silken threads, the females let themselves be wafted by the breeze on warm calm days into Burundi and eastern Zaire. The territorial expansion has continued — into Nigeria, Sudan, and Rwanda.

The cassava mite problem came to CIBC's attention and, in 1974, Dr Bennett requested IDRC's assistance to find natural enemies of the mite in Trinidad and Latin America, where the

pest has been known for some time.

Attempting to use introduced predators against a mite attacking a field crop was a relatively new enterprise. A tiny creature, the mite can appear by the thousands on a single leaf. It sucks the juices of cassava leaves, causing them to drop off prematurely. A heavy infestation can denude the plant, severely retarding its growth.

Dr M. Yaseen, an entomologist at CIBC's West Indian Station in Curepe, surveyed the mite in many Latin America and Caribbean countries. He found that mite densities vary on plants of different ages, severe infestations occurring on plants of 3 to 8 months. The younger leaves also harbour the greatest number of mites. Infestations are highest at the onset of the hot dry season, and are reduced by heavy rains in the wet season. Prolonged dry periods also reduce mite populations. And while mite populations vary on different varieties of cassava, none were found to be totally resistant.

The experiments carried out also aimed to assess the effect of different pesticides. "It's pretty much of a losing battle", says Dr Bennett. "You go out the next day and the pesticides have done a marvellous job, but the mites come back faster, and more abundantly, than before." The effects of various fertilizers have also been assessed, and it has been found that nitrogen and phosphorus fertilizers encourage higher mite populations.

VORACIOUS PREDATORS

Drs Bennett and Yaseen have discovered a rich fauna of mite predators. One in particular — a small black beetle of the Staphylinidae family, *Oligota minuta* cam, was particularly interesting. Its developmental period was short — 15 to 18 days — so it could react quickly to a build-up of mites. It fed voraciously, both larvae and adults consuming all stages of the green mite.

A predaceous mite, the Phytoseiidae *Typhlodromalus limonicus*, was also retained because of its adaptation to varying climatic conditions.

Studies in Uganda agreed with the findings in Trinidad, and it was decided that *O. minuta* and *T. limonicus* should be released in East Africa. The first shipments were made in 1976 and 1977, and although delays in transportation caused high mortality rates, releases were made at nine sites in Kenya. Unfortunately, a number of factors made it impossible to carry out the recoveries, and an unusually wet year kept the mite population low.

Rearing chambers have been set up at the Kenya Agricultural Research Center at Muguga, near Nairobi, from where predators will be distributed to other countries. A CIBC entomologist will lead the fieldwork. Meanwhile, the studies are continuing in Trinidad. The relationship between the cyanide content of cassava leaves (see article page 8) and their susceptibility to mite attack will be examined. More trips are

planned to cassava fields in South America to collect natural enemies not available in Trinidad.

A NEW THREAT

At about the same time as the mite was ravaging East Africa, a new cassava pest was also appearing in Central and West Africa — the mealybug *Phenacoccus manihoti*, hitherto known definitely only in Brazil where it is not a major pest. It built up rapidly and spread from the Republic of Congo to Angola, Bénin, Gabon, Nigeria, and

Senegal. Because of the serious threat it posed to cassava crops, the CIBC began investigations on this pest, its parasites and predators, again with IDRC support.

Surveys in Trinidad failed to reveal mealybug attacks on cassava, but Dr Yaseen found a few in Tobago, and mealybugs attacking other plants were identified. Further surveys revealed its presence in a number of Latin American countries. It was also found that the mealybug was prey to a great number of pests and parasites.

The studies have concentrated on developing suitable breeding techniques for the most promising predators and parasites, and methods of shipping them to Africa. "Nurseries" were set up at the Curepe station: sprouting potatoes kept in jars and inoculated with mealybug eggs or crawlers were then used to develop colonies of parasites and pests. A diet of honey, or honey mixed with agar and sugar, proved adequate for maintaining the adults during shipping.

In August 1978, three types of parasites were sent to Zaire. Initial laboratory and field trials have been encouraging. Another shipment arrived in Senegal in late January 1979, and the parasites are being cultured for release in trial plots. A facility for rearing the parasites is also being established in the Congo. The field work is being carried out by the International Institute of Tropical Agriculture, (IITA) based in Nigeria.

PROSPECTS AND HOPE

To be fully successful, biological control must go hand in hand with the development of resistant varieties. However, it offers the only short term solution to the cassava mite and mealybug problem in Africa. "If we were to take a guess as to which project — mite or mealybug — had the best chance of succeeding, I'd say the mealybug because there has been success in mealybug work before", says Dr Bennett. And, according to Dr Bennett, since the parasites and predators selected for the trials are specific to the pests, there is no danger that they will become pests themselves.

Of the mite control project, Dr Bennett feels that "we've not really been able to do it justice" because of the delays encountered in the field work. These trials should now proceed rapidly as the project enters a third phase. Given a fair trial, says Dr Bennett, *O. minuta* and *T. limonicus* could provide biological control of the green mite in Africa.

A visit to Dr Bennett's home garden plot, on the hill overlooking St Augustine, Trinidad, provides grounds for his optimism. You will see telltale signs of mite infestation on his cassava plants. But if you look closely, you'll also notice a tiny black beetle, *O. minuta*, on the undersides of the leaves. Dr Bennett will tell you he didn't put them there. They came by themselves, in search of the destructive mite. □

MOSAIC AND MITES

Zanzibar's cassava crop — stunted, barren, infested with cassava mosaic disease and green mites — has no claim to fame. Every *shamba* has its plot of diseased cassava, and from these plants the farmers obtain next year's infected, susceptible cuttings.


While cassava mosaic disease affects yields, the farmer's bowl will be far from empty. But since the green mite was introduced from Uganda in 1975, the bowl is every year a little emptier and the remaining tubers of poorer quality. The favoured varieties on the island — sweet, fibreless types — are the most susceptible to disease and to mites.

Along the roads the signs of infestation are clearly visible: tall, defoliated stalks with a token crown of small deformed leaves. The stalks stand unharvested, a testimony to what must be done, and to what is in fact being done in an IDRC-supported project.

The breeding program is working with materials given by IITA in Nigeria. The most tolerant, highest yielding, and most palatable varieties have been selected for further testing. But these imported varieties present some problems, the most important being consumer preference. Zanzibaris eat unprocessed cassava and thus the West African types — usually eaten processed into flour — are too bitter and have a high hydrocyanic acid (HCN) content, making it necessary to ferment the tubers to remove the poisons — a long and tedious process.

A hybridization program, coupling local and foreign varieties, must be carried out to combine the desired characteristics with disease resistance and high yields. This is only the beginning of a varietal improvement program that must continue, year after year, to test, cross, screen, discard, and start over until the problem is solved.

Virginie Price

A full-page photograph of a woman in traditional African attire, including a patterned headwrap and large beaded earrings. She is holding a young child in her arms. The image has a warm, yellowish tint.

*More than agronomic factors
must be taken into account when
promoting cassava in developing
countries*

MESSAGE TO AGRONOMISTS

JEAN-MARC FLEURY

“When you promote cassava in Third World countries, first be sure that you are not running the risk of inducing new diseases as a result of its toxicity.

“The first step is agronomic: introduce varieties low in cyanide content. Second, make sure the inhabitants’ iodine intake is normal. Otherwise, the introduction of cassava risks provoking goitre and mental retardation.”

If Dr François Delange, pediatrician at the Saint Pierre Hospital in Brussels, permits himself to make such recommendations to agronomists, it is because he belongs to a Belgian team of researchers who, in cooperation with l’Institut de recherche scientifique du Zaïre (Zaire Scientific Research Institute), have definitively disproved the conventional belief that iodine deficiency is the sole cause of endemic goitre. When iodine intake is below normal — as in the case of the inhabitants of Idjwi Island in Lake Kivu, and of the Ubangi region in the northwestern part of Zaïre — the consumption of cassava plays a determining role in the development of endemic goitre and cretinism.

It is no news that cassava may have toxic effects. In communities where cassava is a regular part of the diet, stories abound of severe poisoning. They tell of diarrhea accompanied by bleeding, convulsions, coma, and occasionally death — particularly in the case of young children — following the consumption of large quantities of raw cassava, at least of bitter varieties. Poisoning is due to cyanide, which is present at various levels in cassava dishes. According to Dr B.O. Osuntokun of the University of Ibadan, Nigeria, 60 mg of cyanide is sufficient to cause death, and people in Nigeria ingest as much as 50 mg a day. This poison is present in cassava, a kilogram of which may contain anywhere from 30 to 150 mg of cyanide, depending on the variety.

Yet cassava is a staple food for 300 million people, and its popularity is steadily increasing. That cassava is so widely consumed is due, in part, to the fact that there are many ways of eliminating the cyanide. In fact, it is not directly present in the tuber. When growing in the field, the plant contains linamarin, a cyanogenic substance — that is to say, one that is capable of being transformed into cyanide. The plant also contains linamarase, an enzyme that turns linamarin into cyanide on contact, through hydrolysis.

As long as the plant remains intact, the substrate and the enzyme are kept apart. When the plant is harvested, however, damage and deterioration bring the two substances into contact. This is why the traditional processing methods of wetting, mashing, and drying in the sun — which seem to be ideal for bringing linamarin and its enzyme together — are in fact means of eliminating the cyanide through evaporation in the sun or by solution in water.

Yet there is always a certain amount of cyanide left, and in Indonesia and

Nigeria chronic cyanide poisoning is the cause of a well-known pathological condition called tropical neuropathy. The disorder shows up as neurological disturbances associated with the action of cyanide on the spinal cord and peripheral nerves. Tropical neuropathy — a disease of those too poor to afford food supplements richer in protein — affects three percent of the inhabitants of certain regions of Nigeria, according to Dr Osuntokun.

WHAT CAN BE DONE?

According to who some 200 million people throughout the world are affected by iodine deficiencies, but Dr Delange says that this figure is a gross underestimation. The problem persists because people still believe that the solution lies in the distribution of iodized salt.

“This is a total misconception. We have been fighting who for years,” says the pediatrician, “because it still believes that salt is the answer. In many countries these programs are ineffective because of logistical problems — the inadequate preparation of salt and poor distribution networks.”

As part of their work in Zaïre, the Belgian researchers wanted to prove that in an emergency situation a program focused specifically on the distribution of iodine was necessary. The method used consists of injections of iodine in an oil solution; the iodine is resorbed slowly, giving protection for three to seven years, depending on the individual’s sex and age. After treating the people of Idjwi Island, the research team undertook to examine all the inhabitants of the Ubangi region, one by one. By the end of 1979 half a million people had been examined, making the Zaïre program the most extensive of its kind.

“This is an extremely effective, totally harmless, and inexpensive method,” states Dr Delange.

Thanks to massive injections of iodine in oil solution, which greatly alter the iodine/thiocyanate ratio in favour of the iodine, the number of goitre cases and mentally handicapped children in northern Zaïre is dropping steadily and will continue to do so... at least for a few years.

Cyanide not only has a toxic effect on the nervous system; it also attacks the thyroid gland. It is now known that this toxic effect is due to a metabolic process that transforms cyanide into thiocyanate, a substance that prevents iodide, or salt of iodine, from being absorbed by the gland. The prime function of the thyroid is to synthesize hormones in which iodine is an essential constituent. These hormones stimulate the processes through which all

the cells carry out their synthesizing functions. A shortage of these hormones slows growth and upsets all the metabolic processes. When daily iodine uptake drops below 100 micrograms, the pituitary gland “instructs” the thyroid cells to multiply, the gland hypertrophies or grows unnaturally, producing goitre.

The first person to attribute goitrogenic properties to cassava was Dr O.L. Ekpechi of the Faculty of Medicine, University of Nigeria at Enugu, in 1964. He had been struck by the disparities in the goitre rate of various villages. At Eha-Amufu, for example, he discovered that 38 percent of the inhabitants were suffering from goitre, whereas only 9 percent of the inhabitants of Nsukka were goitrous. He found that the water of Eha-Amufu contained three times as much iodine as that of Nsukka, a fact totally inconsistent with the conventional findings that a shortage of iodine in drinking water was the cause of goitre. A study of diet then led Dr Ekpechi to suspect cassava, and experiments on rats seemed to confirm an anti-thyroid action of cassava. It remained to prove the hypothesis and demonstrate the mechanism in humans. This was the goal of the team of Belgian and Zaïrean researchers, whose work was supported by IDRC.

The team began by examining the 38 000 inhabitants of Idjwi Island in the middle of Lake Kivu — an iodine-poor body of water — in northeastern Zaïre. The researchers made a surprising discovery: the rate of goitre, both in humans and in rats, was extremely high, 55 percent, on the northern part of the island, whereas it was only 5 percent in the south. “As goitre is caused by a shortage of iodine (the traditional explanation), we expected to see a relatively significant iodine shortage in the north,” said Dr Delange. Much to their surprise the researchers found equally low levels in both regions — an average daily intake of only 13 micrograms of iodine. The traditional explanation was no longer valid, and another one had to be found. Could it be a matter of genetic differences? Impossible — everyone had the same ancestral background. The environment was also the same. But what struck the researchers was that, despite very similar diets, the people in the north consumed greater quantities of cassava than those in the south. They thus arrived at the same conclusions as Dr Ekpechi.

In 1973 the researchers left the region. A treatment program consisting of injections of iodine in an oil solution had eliminated goitre and, along with it, the possibility of continuing research. They then tackled the Ubangi region of northwestern Zaïre, where endemic goitre afflicts 65 percent of the two million inhabitants. The region also has an unusually high rate of cretinism: between one and eight percent of the total population.

The iodine shortage of the region would in itself explain the presence of goitre, but the research team has shown

that the inhabitants' high levels of thiocyanate — due to the consumption of cassava — aggravated the effects of iodine deficiency. The effects of high concentrations of the compound showed up particularly in newborns and young children, among whom there is an extremely high congenital hypothyroidism rate of 15 percent. Many children suffer from neurological disorders so severe that they are labelled "cretinoids", and even children who exhibit no sign of cretinism show impaired psychomotor development. In fact, the inges-

tion of cassava by expectant mothers seems to be a significant factor in the development of the thyroid disorders observed in infants. "This disease in large part explains the intellectual and economic stagnation of the Ubangi region," concludes Dr Delange.

In short, the research team has proved that endemic goitre in northern Zaire, characterized by an exceptionally high rate of (myxedematous) cretinism compared with findings in most of the other instances of endemic goitre, results from an imbalance in the iodine/thio-

cyanate uptake ratio. The critical threshold is 4 micrograms of iodine for each milligram of thiocyanate. Thus, there is no opposition in principle to the consumption of cassava.

"Determine the amount of iodine ingested by a given population," says Dr Delange, "and you [agronomists] will know the amount of thiocyanate to which it can be exposed. As long as you are above this ratio no nutritionist can reproach you." □



Small farmers, like these in Senegal, could benefit from high-yielding cassava varieties, resistant to diseases and pests.

ICED CASSAVA

Because the diseases that affect cassava are not the same from one continent to another, the exchange of plant material between breeders is very strictly controlled to guard against any spread of disease. The mosaic virus, which infects cassava plants in Africa and India, prevents those areas from exporting their best varieties to other producing areas.

In Canada, scientists at the Prairie Regional Laboratory of the National Research Council of Canada in Saskatoon are currently working on a method that may hasten the unrestricted exchange of disease-free cassava material. Working with the fi-

nancial support of IDRC, they have regenerated complete plants from a few cells taken from the tips of cassava stems. These cells form meristems; it is their multiplication that ensures the growth of the plants. Generally, meristems are not immediately susceptible to infection by viruses. As all parts of the cassava shrub grow from meristems, it is possible to grow plants free of mosaic by using only them.

Having completed this step, the Canadian team is now trying to perfect a procedure for storing meristems — which are barely 0.2 mm long — at -196°C , the temperature of liquid nitrogen. The researchers have already succeeded with beans and strawberries. If they can achieve the same results with this tropical plant, the cost of storing the genetic material will be reduced considerably and international exchange facilitated.

IF NOT DISEASE ...INSECTS

In the past 10 years or so, researchers have made giant strides in their efforts to improve cassava. In Africa, they have identified several varieties that are resistant to leaf mosaic, the tuber's number one enemy on the continent. In Southeast Asia and Latin America, so great is the fear of African mosaic that severe restrictions are placed upon exchanges of genetic material with Africa.

Just when the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, was beginning to produce some mosaic-resistant varieties that could have signaled a "cassava green revolution", along come two insects from South America that put researchers right back to square one.

The green spider mite is a cassava pest that has been making inroads in Uganda since the beginning of the 1970s. In some areas, small farmers lose up to half of their potential harvest to the pest. At present, the Institute has not found a mite-resistant cassava, although indications of resistance have been discovered in a Tanzanian variety. The IITA is hoping shortly to incorporate this quality in its high-yielding varieties.

But no one has yet discovered any varietal resistance to the cassava mealybug. In their struggle against this pest, researchers have resigned themselves to a long campaign of biological control. (see page 6)

Cassava experts scarcely expect to see the day when they have permanently vanquished all the enemies of the tuber. Still, they would very much like African farmers to benefit from new varieties that are low in hydrocyanic acid (HCN) (see page 8) and yield between 40 and 68 tonnes per hectare.

Making sure that the projects run smoothly is the responsibility of more than the researchers

FINANCE OFFICERS partners of research

BOB STANLEY

There is one group of people involved in international development research whose activities are rarely heard of, yet who play a vital role in the successful execution of a research project. They are the project finance officers — accountant-administrators whose job it is to administer the cash that keeps the wheels of scientific inquiry turning.

Recently a dozen of these professionals from nine Asian countries abandoned their books and budgets long enough to attend a conference with some of their counterparts from IDRC's treasury division. The purpose of the three-day meeting at IDRC's Asia regional office in Singapore was to provide an opportunity for the finance officers to learn at first hand more about IDRC in general, and its financial procedures in particular, and to give both groups a chance to air their problems and concerns.

What emerged from three days of informal sessions was a clear impression that the finance officer is just as much a part of the project team as the professional researcher — and the job is every bit as demanding.

Consider, for example, that there may be as long as five or six years between initial proposals and final completion of a research project.

Somehow the finance officer must accommodate within the budget all the changes that can take place in that time. Inflation and currency fluctuations take their toll, equipment may have to be substituted, staff may change, even the research plan itself may alter during that time — research, after all, is by definition an exploratory process.

Moreover, the finance officer must cater to the needs of the team's research professionals, whose primary objective is to conduct research, and at the same time meet the demands of donor agencies such as IDRC to stick to an agreed budget. In addition, since most IDRC-supported projects are only partly funded by the Centre, he must abide by the regulations of his own government department or institution.

Allowing an over-enthusiastic scientist too much licence with the budget can be hazardous. Several of the conference participants pointed out

that their governments have a somewhat draconian system that makes the project finance officer *personally* responsible for any unauthorized expenditure. Deputy controller S.K. Sharma, of India, reported he even knew of a case of such "punishment" where a man was obliged to continue repayments right up to the time of his retirement.

It is not a system that encourages initiative. Yet the participants were also aware of the possible consequences of delaying a research project by restrictive controls and regulations. In an agricultural project, for instance, pointed out administrative officer T.B. Pussegoda, of Sri Lanka, a delay of a few weeks could mean missing the planting season, with subsequent months of delay.

"The projects must go on," he added. "We have to try to find some way to do it without delay. Our job is not to say how the money should be spent, but to make sure it is not misspent. It is our duty to find that money somewhere — our duty to the project and to our country."

How useful was the conference? Centre trea-

sury personnel went back to Ottawa armed with numerous recommendations that should make for smoother working relations between the Centre's project accountants and their counterparts in recipient institutions. And the participants themselves agreed that they learned a good deal from the meeting, not just about IDRC, but also by sharing their experiences in handling a variety of projects for different agencies.

Commented Mrs C.P. Chin of the Institute of Southeast Asian Studies: "Now we understand not just what is required, but why. Preparing all the information can be a burden, but this workshop will make it easier."

Added Mr Sharma of India: "Even in the best planned research project the unexpected cannot be ruled out. So it has been very helpful to learn of the flexibility of IDRC's procedures."

And the last word goes to Mr Pussegoda of Sri Lanka: "I have come to know the real ideology of IDRC — the rules are there to interpret, not to act as a constraint." □

The simple solution

Diarrhea and intestinal infections continue to be leading causes of death and illness in young children: it is estimated that there are 500 million diarrheal episodes every year among under-fives, resulting in 5-10 million deaths in Africa, Asia, and Latin America. An IDRC-supported project in Egypt may help cut down this appalling toll.

Dehydration is the major complication of diarrhea in children; a fluid loss of about 10 percent of body weight can cause death within a few hours. Rehydration in the first 6-8 hours of a diarrheal episode can mean a difference between life and death. A simple oral rehydration solution, consisting of three salts dissolved in safe drinking water — sodium chloride (table salt), sodium bicarbonate (baking soda), and potassium chloride — together with glucose or sucrose (sugar) to speed their absorption, was developed in the late 60s. Results indicated that the oral solution provided an inexpensive and simple method of warding off dehydration in its early stages.

But a major problem to widespread community or household use of the therapy is a lack of education about diarrhea and the importance of early treatment of dehydration. Diarrhea is so common that it is considered to be a normal part of childhood

rather than a disease, and is often not treated in its mild form. And often, mothers will withhold fluids and take their children off solids during bouts with diarrhea, believing that they only aggravate the illness. Instead, malnutrition is aggravated, further weakening the child.

Researchers from the High Institute of Public Health of the University of Alexandria are now working to solve this problem by developing a community health education program to determine the most effective means of employing this therapy where it is most needed. The project should assist the Ministry of Health in its program to provide oral rehydration therapy throughout the country.

New case for population plan

Two scientists — John Knodel of the University of Michigan and Etienne van de Walle of the University of Pennsylvania — are challenging the proponents of the Bucharest prescription for lowering birth rates, summed up as "development is the best contraceptive".

On the basis of a review of demographic studies, they suggest that while there is a "loose relationship between socioeconomic modernization and fertility decline" in 19th Century Europe (the model for the Bucharest assumption), the introduction of the concept of family limitation along

with means of fertility control was a major factor in the reproductive revolution. They point out that recent fertility declines in a number of developing countries confirm their observation. For example, in Taiwan, the fertility decline showed a pattern very similar to that of Sweden, but Taiwan did in 20 years what it took Sweden 80 years to accomplish.

The authors examined data for 17 European countries at the time when their fertility decline occurred. They found no evidence of a minimum level of development needed before fertility change. With regard to the assumption that the decline in infant mortality was a decisive factor, they found no evidence to support it.

They believe that the cultural setting materially influences the onset and spread of fertility decline. One strong cultural factor is the status of women, and they note that "where the female role is subordinate and where women are isolated from the broader communications network, policies designed to alter the status of women may be more conducive to reduced fertility than either family planning alone or more general development efforts."

Knodel and van de Walle conclude that promoting general development projects without extending family planning programs

will not speed fertility declines.

Wild wheat

Searches in Samaria and Judea and the watershed of the River Jordan have revealed a lost progenitor of modern wheat, *Triticum searsii*, one of the three species that have given present-day wheats their special properties, reports the *Newsletter* of the International Board for Plant Genetic Resources.

Wheat breeding has been limited, in a sense, until this discovery, because only two of the crop's forebearers (*T. monococcum* and *T. tauschii*) were known. These "ancestors" contributed to the winter hardiness, disease resistance, and baking qualities of modern cultivated wheat varieties.

The rediscovered wild wheat contains many important genes, and is largely responsible for protein content and drought resistance in its descendants.

Scientists have been concerned for some time that the genetic materials in the world assortment of common and durum wheats have been exploited to their fullest. Drawing on the resources of wild relatives presents one of the most promising ways to restore and enrich the gene pool of wheats and other crops.

Baby bottle issue heats

The baby bottle feeding

A solution for diarrhea is tested, a population theory challenged, and an ancestor of wheat is found.

issue continues on the heat. A joint who/Unicef meeting on "Infant and Young Child Feeding" in Geneva, late last fall, recommended that there should be "no sales promotion, including promotional advertising, to the public of products to be used as breast milk substitutes or bottle fed supplements and feeding bottles." It also set about to draft an international code of marketing for such products to be adopted by exporting and importing countries and observed by all manufacturers.

Development action groups maintain that infant food manufacturers are likely to make "interpretations of convenience" of any code, and that marketing practices remain inconsistent with the letter and spirit of the who/Unicef recommendations. Product boycotts — focusing primarily on the Swiss-based multinational Nestlé — and letter writing and public information campaigns will be intensified in the coming months to bring public pressure for compliance to bear on the companies.

Criticism of aggressive advertising practices of baby food manufacturers began in 1973, with charges that "unethical and immoral" sales methods were used to market the foods in the Third World, where neither the money nor the hygienic conditions exist to use the products correctly.

Mother's milk a bargain

Yet another weapon has been added to the arsenal of the anti-bottle-feeding league: economics.

An FAO report on the declining use of mother's milk in Ghana and the Ivory Coast concludes that if breastfeeding were to increase so that every infant was breastfed for two years, the savings in national goods cost could amount to \$us28 million annually, in the Ivory Coast alone. Each family could save \$600-730 a year, not including the savings resulting from better health. If breastfeeding was to decline to the level of Paris in 1955 (chosen for comparison), the annual national cost would be between \$33 million and \$55 million.

Because the study looks at human milk solely as a food commodity, it bases its calculations only on measurable costs. In the case of breastfeeding, this includes the cost of the additional food needed by the mother and the value of the mother's time. In the case of bottlefeeding, the cost of materials — formula, bottles, fuel, and equipment needed to sterilize the bottles — and the value of a person's time to feed the child are calculated.

The report states that, paradoxically, those aspects of the economic value of breastfeeding that are quantifiable in economic terms are those that are of the least economic significance at the national level. The

major impact of breast-feeding on national economic development is associated with its health-promoting and birth-spacing effects, and these cannot presently be quantified.

Agroforestry newsletter

The International Council for Research in Agroforestry (ICRAF) has produced the first issue of a new publication of news and comment concerning the growing field of agroforestry.

Among the items in the first *ICRAF Newsletter* are a page devoted to definitions of agroforestry given by nine scientists interested in the subject; a feature article on the first International Conference on International Cooperation in Agroforestry (held 16-22 July 1979 in Nairobi) that outlines some of the concerns of research and training and gives guidelines on how to make both benefit shifting cultivators and rural inhabitants of tropical countries; notices of meetings and workshops; and an account of a new scientific publication on soils research in agroforestry. Contributions and letters on agroforestry topics are invited for future issues. *ICRAF Newsletter*, PO Box 30677, Nairobi, Kenya.

Building a better buffalo

The ubiquitous water buffalo is so much a part of

the rural scene in Asia as to go almost unnoticed. Yet this perennial beast of burden is the motor that drives much of the Third World's small-scale agriculture. It is also an important source of meat, milk, and much more besides — just about every part of the animal can be used, from hair to hoofs.

Despite the advent of agricultural mechanization the use of the water buffalo is on the increase: the FAO estimates their numbers have almost doubled in the past 25 years. And at last their importance is being recognized, as several countries now have animal research programs studying ways to breed better buffalo, and seeking potential uses for all those by-products.

In 1978 a group of eight Asian countries agreed to share their research efforts, and as a first joint step, decided to set up an international buffalo information program. The group turned to the FAO for help, which in turn asked IDRC to lend its considerable expertise in setting up global and regional information systems.

International interest and the demand for a buffalo information centre is now growing. The long-term aim would be to establish a clearinghouse for the world's literature on buffalo research. With water buffalo currently found in about 40 countries, that could be a major undertaking.

Criticism harries the infant food industry, while breastfeeding makes economic gains. Information on trees and buffalo proliferates.

ONE ROOM ONE SCHOOL

BOB STANLEY

*An old idea in education may be
the answer to contemporary problems*

Several islands break the waters of the Nile River as it flows through the centre of Cairo. One of these, a long narrow strip of land called Beyn El Bahryn island, is home to some 3000 people. But in spite of its location in the heart of the largest city on the African continent, the island is virtually undeveloped, its people mostly farmers.

To journey to the island in a tall-sailed dhow from beneath the walls of Old Cairo is like a voyage into a different world. Less than a kilometre away the roar of Cairo's infamous traffic carries faintly across the water, but keep your eyes below the horizon and this could be any one of Egypt's 4000 villages.

Rising above the island, the tall finger of the mosque can be clearly seen even from the city shore; up close it dominates the village. Adjoining the mosque is the village school — a single large room with concrete floor and concrete benches around the walls and down the centre.

The villagers themselves helped to build and finish this hall, and it also serves as a community centre for meetings, weddings, and other gatherings.

What makes this school different, other than its unique location, is its participation in a country-wide project that could help to meet the government's aim of bringing free primary school education to the country's almost six million eligible children.

This is known as a one-classroom school. In many respects it resembles the old one-room schoolhouse that was once the mainstay of the education system in rural North America. It is a flexible system, open to any child between the ages of 6 and 14 at any time — without formal application or fees.

It is hoped that the one-classroom school concept will help solve two problems: it will provide basic education to the remote areas that previously had no access to schools of any kind, and it will help to solve the dropout problems because students are free to leave whenever other responsibilities call, and return when they are able.

Depending on availability and location, the teacher may be a local government official, the *imam* of the mosque, a teacher in training, a university graduate conscripted for civic service, or even a teacher from another school willing to work extra hours. All receive intensive training, however, and are provided with course outlines.

After nearly five years there are more than 3500 such schools, all established with community participation, attended by some 125 000 pupils. Obviously the concept has caught on with the villagers, but how effective is it as a means of providing primary education?

Until last year there had been no organized attempt to answer that question. Now the Egyptian National Centre for Educational Research (NCER), with the support of an IDRC grant, has begun an extensive study of the results from 50 one-classroom schools selected at random across the country. The school on Beyn El Bahryn island is one of them.

Four classes are held simultaneously in the school. The children sit on rush mats on the floor. The benches serve as desks. There are two teachers, both recent commerce graduates who chose a year of teaching for their civic service. At one end of the classroom Nahid Mohamed Radwan instructs one of her two classes in science, using a water hyacinth from the river to illustrate the lesson. At the other end Leila Mohamed Gawish conducts a writing lesson, using a blackboard that is simply painted on the wall.

The other two classes are led by monitors as they await their next turn with their respective teachers. There are about 130 pupils registered at the school, they come in two shifts, six days a week. It is hard work for the young teachers, but they seem to enjoy it.

In fact, teaching has changed Leila's ideas on her future career. When her year of service is over, she says, she would like to go back to college — this time to teacher training college to become a "real" teacher. □





Clockwise, from left: Nahid Mohamed Rawan teaches a grade three science class the workings of a water hyacinth. Middle, the one-room school accommodates up to 130 pupils in two shifts per day. Right, a monitor leads a grade two class awaiting their turn with the teacher. Below, Leila Mohamed Gawish leading her grade one and two classes: now she would like to become a "real" teacher.



SURVIVAL

ON THE BRANDT PLAN

ROWAN SHIRKIE

"Our Report is based on what appears to be the simplest common interest: that mankind wants to survive, and one might even add has the moral obligation to survive. This not only raises the traditional questions of peace and war, but also of how to overcome world hunger, mass misery, and alarming disparities between the living conditions of the rich and poor. "If reduced to a simple denominator, this report deals with peace."

Willy Brandt's introduction to *North-South: a programme for survival*, the report of the Independent Commission on International Development Issues that, for two years under his chairmanship, investigated the problems and concerns of development, is direct. The report itself is no less straightforward in its conclusion that the world community must act very quickly to solve the problems, or move toward chaos and its own destruction. "It is clear that the world economy is now functioning so badly that it damages both the immediate and the longer-run interests of all nations."

At the same time that the report describes the enormous gulf that separates the "North" or rich developed countries, from the "South" or poor developing countries, it reveals the many connections that make the world interdependent. Countries depend on

one another for food, raw materials, manufactures, and markets — and all are threatened by the problems within the system, be they hunger, inflation and monetary crises, or armaments.

The strategy mapped out by the Brandt Commission contains not only long-term strategies, as one would expect, but also an emergency program for the next five years.

For the long haul, priority must be given to the needs of the poorest countries and regions, and substantial — massive — transfers of resources made to the developing countries. The report recommends that Official Development Assistance (ODA) rise to one percent of GNP of developed countries by the turn of the century. Current ODA falls very short of the 0.7 percent of GNP set as a target by the United Nations a decade ago. A suggested international taxation — based on arms production, international travel, or global commons like deep sea minerals — could provide an automatic source of revenue. Improvements in international financial institutions should be made, and a new institution — a World Development Fund — be established to administer the increased resources.

"The world must aim to abolish hunger and malnutrition by the end of the century through the elimination of absolute poverty," the report says, and as

a means of reaching the goal, agrarian reform is "of great importance". Food aid linked to employment programs should be increased without weakening incentives for local food production. Special attention must be paid to irrigation, improved fertilizer use, fisheries and aquaculture, and agricultural research — as part of a process to "create and distribute both the required food and the employment and incomes which will enable the food to be bought by those who need it."

The report does not give population growth elaborate consideration, combining growth rates, migrations, and the environment in one short section. It follows the "development reduces birth rates" theme, and sees the population explosion as abating, although warning of the "risk that widespread trends of fertility declines may create the impression that the situation is taking care of itself." Population must be stabilized so as to strike a satisfactory balance between people and resources.

A key concern of a new international economic order will be in the operation of the international commodity markets. Primary commodities — agricultural products and minerals — contribute as much as half of the gross national product of the countries of the South in export earnings. Price fluctuations, and terms of trade considered unfavourable to the producing countries, have reduced potential benefits. "The commodity sector of developing countries should contribute more to economic development," the report recommends, "through the greater participation of these countries in the processing, marketing, and distribution of their commodities." New financial, trade, and price stabilization measures providing better returns are suggested.

INDUSTRIAL ADJUSTMENTS

Increasing industrial activity on the part of developing countries — the other side of the commodity coin, in a sense — has been one of the goals of development and one of the fears of the already industrialized developed countries. Continuing industrialization requires access to international markets, and although trade among South countries themselves may become important under proper management in the future, expansion for the present means in large part penetrating markets in the North. The prospect of further competi-



"... the shaping of our common future is much too important to be left to governments and experts alone..."

AN EMERGENCY PROGRAM

The Brandt Commission, while charting a long-term course of action, also proposes an emergency program of immediate actions for the next five years. This program is essential "if the world economy is to survive the threatening crisis of the years immediately ahead — a crisis which could itself immeasurably diminish the prospects of achieving results from the programme of priorities."

The emergency program combines four of the main thrusts of the overall survival plan:

- A large-scale transfer of resources to developing countries and regions, and financing for the debts and deficits of middle-income countries. It would require donor countries to commit themselves to reaching an ODA target of 0.7 percent GNP by 1985 — an additional \$30 billion in aid annually. World Bank lending should

be doubled, and IMF gold stocks used to raise more money for both the poorest and middle-income countries. The bottom line: a virtual three-fold increase in aid flows to developing countries, reaching \$50-60 billion a year by 1985.

- An international energy strategy, with components of regular and secure supplies; "vigorous conservation" with agreements by energy-consuming countries to hold down consumption to levels below those of 1977-78; gradual and more predictable price increases in real terms, through indexation related to world inflation, for example; and more research and development of alternative and renewable energy sources.

- A global program of increased food production and agricultural development supported by a boosting of aid resources and a reassignment

of Third World priorities, backed up by improved food security mechanisms and increases in emergency food supplies.

- A start on some of the major reforms of the international economic system, including fuller participation of developing countries in the monetary and financial system, and acceleration of efforts to improve developing countries' conditions of trade in commodities and manufactures.

To launch the emergency program, and provide a new focus and concentration on global problems and their resolution, the Brandt Commission urges calling a summit of world leaders as soon as possible. Nothing should delay "discussion and negotiation at the highest level", which it suggests should involve about 25 world leaders in thrashing out new directions and taking the "first steps towards committing themselves and their people to a global agreement for the benefit of the whole world."

tion from foreign industries, resulting in lost markets and unemployment, has alarmed business organizations, political parties, industrial management, and unions in the North, and led to demands for protection or subsidies.

The commission counters that "adjustment to new patterns of world industrial production be accepted as a necessary and desirable process", and points to the dangers of protectionism in bringing "higher costs to consumers and long-run losses to the whole economy through keeping resources away from the dynamic sectors." Attempting to limit the exports of the South will deny them the earnings and ability to import in turn, thus hampering the creation of new and more productive jobs in the North. The Commission urges the North to follow policies of adjustment and roll back protective barriers, and the South to maintain fair labour standards in order to prevent unfair competition. A new international trade organization and improved co-operation in establishing and administering the conduct of trade are recommended. More effective national laws and international codes of conduct to govern the sharing of technology and transnational corporations, and increased efforts to transfer appropriate technology and develop technological capacity, are also suggested.

ENERGY AND ARMS

The program for survival is terse on energy, eloquent on disarmament.

The transition from dependence on nonrenewable sources of energy — particularly oil — must be made in an orderly fashion. Ultimately, the world must come to depend on the inexhaustible sources of solar, wind, and biomass energy, giving high priority to hydro and solar technology develop-

ment in the South, coal and alternate forms of nuclear energy in the North. The present nuclear alternative is "problematic" due to safety concerns and public opposition. Energy is a principal element of the emergency program (see box).

On disarmament, a "moral link" is forged between "the vast spending on arms and the disgracefully low spending on measures to remove hunger and ill-health in the Third World." Pointing out that while total military expenditures are approaching \$450 billion a year, annual spending on official development aid is only \$20 billion — slightly more than four percent of the arms budget. It suggests that one of the chief enemies of disarmament is the sense of resignation and acceptance of the need for defence spending in spite of the awareness of its dangers. The Commission has no new strategies to add to SALT talks or *détente*, but encourages a greater awareness of the "terrible danger to world stability caused by the arms race", and of the "burden it imposes on national economies, and of the resources it diverts from peaceful development."

Tackling the problem of reform in the world monetary order, the Commission endorses proposals that would improve the exchange rate regime, reserve system, balance of payments adjustment process, and "the overall management of the system which should permit the participation of the whole international community," including enlarging the participation of developing countries in the staffing, management, and decision-making of the International Monetary Fund (IMF).

Part of the Commission's investigation dwelt on the responsibilities of the developing countries to "match the efforts for international economic and social justice with efforts to promote

the same ends...". Cautious not to appear to dictate a set of national conditions on which international reforms might be contingent, the commission nevertheless called for a redistribution of productive resources and incomes in countries where essential reforms have not yet taken place. Improvements would include "expansion of social services to the poor, agrarian reform, increased development expenditures in rural areas, stimulation of small-scale enterprises, and better tax administration" for satisfying basic needs and boosting production. Improvement in economic management and public administration are encouraged, as are more mechanisms of self- and mutual-help and the nurturing of an indigenous technological capacity. The "capital surplus" developing countries — mainly the OPEC members — are urged to enter into tripartite arrangements with industrialized countries and lesser developed countries on development projects.

The Brandt Commission has drawn up an ambitious — critics might say unrealistic — program for survival. Brandt has been quoted as saying "I'm far from being a blue-eyed optimist, but I think we have given some food for thought to governments, international organizations and enlightened public opinion." The Commission drew on considerable political expertise — among its members, three former Prime Ministers and a former President — and the report is informed throughout with the knowledge that its goals are attainable only if sincerely accepted by governments directed by an enlightened public. And so, believing that "the shaping of our common future is much too important to be left to governments and experts alone," the Brandt Commission makes its report to all individuals concerned with the simple common interest of survival. □

Aid as Obstacle

FRANCES MOORE LAPPÉ,
JOSEPH COLLINS, and DAVID KINLEY

Justifying their programs, aid policymakers assure us that they follow mandates for reform. The principal purpose of development assistance programs, we are told, is to meet the basic needs of poor people in the developing countries. And as most of the world's nearly one billion underfed live in rural areas, aid is now directed, we are told, to agriculture and rural development. Food aid programs, too, are designed, it is claimed, to directly benefit the poor and contribute toward food self-sufficiency.

Along with the "new directions" thrust of major aid programs has come a catchy new terminology to describe it. Today, we hear about "integrated rural development", "appropriate technology", "popular participation", and "raising small farm productivity." Moreover, aid, we are assured, has been linked to human rights and other political considerations in order to encourage more democracy and less repression in recipient countries.

But, no matter how seemingly appropriate the

terminology, whether our foreign assistance programs help or hurt the poor and hungry abroad depends entirely on whether they attack the root cause of their suffering. "Root cause" has itself become another popular phrase — sometimes used glibly. So we must be very precise in what we mean.

All of our research at the Institute for Food and Development Policy has led us to conclude that the cause of hunger and rural poverty is not overpopulation, nor a scarcity of agricultural resources, nor lack of modern technology. Rather, the root cause of hunger is a tight concentration of control over food-producing resources. Because hunger and rural poverty are generated by grossly unequal power relationships among people that determine who will benefit from the food-producing resources, it cannot be overcome by any combination of material inputs, no matter how "appropriate".

The basic fallacy inherent in official development assistance is

that it can reach the powerless by going through the powerful. Not only are additional material resources basically not needed to eliminate hunger, but the influx of such resources, where control is highly concentrated in the hands of the few, ends up bolstering the powerful local and national elites that stand in the way of increased power over resources by the now dispossessed majority. Official foreign assistance necessarily flows through the recipient governments and too often, particularly in those countries to which we limit aid, these governments comprise just such narrow, elite economic interests. This is a hard fact of life.

Foreign aid, then, does not and cannot play a transforming role — transforming an anti-democratic economic control by a few into a participatory, democratic process of change. It cannot change power relationships that already exist. Certainly this is the case with government-to-government, "bilateral", aid. Only with great difficulty can the injection of resources through private or voluntary agencies avoid the same dynamics.

We challenge the claims of aid policymakers that they are now focusing on the poorest countries — and on those countries demonstrating commitment to their poor. Our research shows instead that the bulk of aid flows to

some of the world's most elitist and repressive regimes. We challenge the claim that most aid programs are now targeting the poorest groups. The greater share of funds go instead to large-scale infrastructural projects benefiting those already in control of land and marketing. Finally, we argue that even those few projects that do promote small farmers are not helping but hurting the real poor rural majority — the landless and near-landless.

Government aid and aid agencies such as the World Bank cannot ally themselves with the poor because the definition of the problem of development, reflected in their projects, is wrong.

The official diagnosis of why people are poor and hungry is that they have been "left out" of the development process. From this diagnosis flows one solution — bring the poor *into* development. "Basic needs" strategies are seen as a way to expand the development process to include the poor. Such a diagnosis is simply another version of a fallacious belief — that one can reach the poor by enlarging a process controlled by the rich.

A very different diagnosis is that rather than being left out of the development process, the poor and powerless have been an integral part of the process — both as resource and victim. The poor have provided their labor, their

"The basic fallacy inherent in official development assistance is that it can reach the powerless by going through the powerful."

products, and often their land. The challenge of genuine development, then, is not to bring the poor into the development process, but to enable the poor to achieve the power they need to direct a development process in their interests.

Similarly, the official aid agencies' diagnosis is that the poor are poor because they lack certain things — irrigation, credit, better seeds, good roads, etc. But, we ask: *why* are they lacking these things? We concluded that the poor are poor because they are prevented from achieving the power to secure these things. The first diagnosis focuses on the material lack; the second focuses on the lack of power. Therein lies the fundamental difference.

From these very different definitions of the problem flow two very different roles for the outsider. From the official diagnosis, the appropriate role for the outsider is to supply needed resources. Based on our definition of the problem, the appropriate role for the outsider is to help remove obstacles now blocking those who are uniting and working to achieve a more just sharing in control over resources. Citizens, for example, should help remove obstacles in the way of the hungry, poor majority by working to end government and corporate support for the few who now monopolize food-producing resources in so many countries.



Participation in decision-making is essential.

To truly ally themselves with the interests of the poor, aid agencies would have to support those groups throughout the Third World that are directly and indirectly confronting the issue of power — control over resources — in their communities, in their societies, and internationally. To do so would pit these agencies against the interest of the elites dominating most governments in the world today, including in the United States and Canada. To do so would also be to risk supporting democratic economic alternatives that would contrast with what we accept for ourselves. Obviously, a government agency is not about to do either. That is why we conclude that government agencies are structurally incapable of arriving at a correct diagnosis of the root causes of hunger — a diagnosis that puts control over resources in the central position.

The role for concerned North Americans, then, should not be to try to make our aid agencies live up to their new development rhetoric. Our energies would be misplaced. Worse, we would actually be contributing to the problem by reinforcing the notion that foreign aid can help in countries where control over resources is tightly concentrated. Once we understand that government-to-government aid cannot transform power relationships, but only reinforce what is there, it becomes clear that we must work to limit such aid only to countries where there is already underway a fundamental restructuring of decision-making power. And in such countries, aid can only be of value if given without strings so the recipient's interest, not the donor government or corporate interests, can prevail.

In the past, many who have called for a halt or cut

in foreign aid have been those saying, "Cut them off. Let them solve their own problems. We must take care of our own." Such is not what we are saying. We are not saying North Americans have no responsibility for the suffering of millions abroad. We do. We have a heavy responsibility for the many powerful obstacles to change abroad that are being reinforced today with our tax dollars and in our names — obstacles built by economic, military, and corporate interventions in the Third World. Our responsibility is to remove such obstacles and at the same time work to make our own societies democratic and self-reliant so that one day they can play a constructive role around the world. □

*This commentary is an excerpt from the book *Aid as obstacle* to be published this summer by the Institute for Food and Development Policy, 2588 Mission Street, San Francisco, California 94110, USA. Lappé and Collins, together with Cary Fowler, are authors of *Food first: beyond the myth of scarcity* (Ballantine books, revised edition, 1979; published in Canada by Random House of Canada Ltd., Toronto).*

Commentary provides a forum for readers to explore topics raised by Reports, or to present alternative perspectives, informed opinion, and analyses of development issues.

The responsibility of the individual is to work to remove the obstacles to change.



Business in LDCs

SMALL AND MEDIUM CAN BE BEAUTIFUL

A.T.R. RAHMAN

A major paradox in the development patterns of developing countries is an excessive concentration of capital-intensive big enterprises when the basic developmental characteristics of these countries — large labour supply, scarce capital, technical simplicity, limited managerial capacity — call for the promotion of technologically simpler, labour-intensive small enterprises.

This situation, resulting largely from the preference given by both developing-country leaders and aid agencies to large-scale advanced technological enterprises, has led many to equate conventional economic policies with the perpetuation of poverty, maldistri-

bution of income, unemployment, and waste of resources.

It has become increasingly clear that conventional development policies cannot solve the critical problems faced by many developing countries, particularly unemployment problems. For example, the labour force in the developing world expands by about 26 million persons each year, and two out of three of these new job-seekers have to find employment off the farm. But the expansion of industrial employment, limited by capital intensity, cannot absorb most of these new job-seekers.

It should be clear to planners and policy-makers that small enterprises have many advantages other than gen-

erating employment. In certain sectors, such as products and services, they are as efficient as large enterprises in utilizing resources. They are also important in fragmented markets and in situations where transport costs are high. Small enterprises also contribute to regional development and the development of backward areas, and help ensure broader sharing in economic benefits and decisions. Small enterprises can be technically innovative, adapting production techniques to a country's particular circumstances. They also adapt more readily to the country's social and cultural environment.

Despite the benefits to be gained by the development of small enterprises, as the International Labour Organization (ILO) notes in one of its studies, "it has been only during the past two decades that fully comprehensive programs designed to promote small enterprise development as part of national development plans have taken shape." In terms of scope and effectiveness of these programs, the ILO report concludes that, compared to other economic sectors, small enterprises "receive in many cases only the barest minimum of legislative, financial, technical, and other forms of assistance."

Given the importance of small enterprises, and the mixed results from previous government support programs, IDRC agreed to support a critical study initiated by the Association of Development Research and Training Institutes of Asia and the Pacific (ADIPA). Involving seven Asian countries — Bangladesh, India, Thailand, Malaysia, Philippines, Hong Kong and South Korea — and coordinated by the Small Industry Extension Training Institute (SIET) of Hyderabad, India, it examined government policies and programs for developing small enterprises. It paid special attention to the various promotional and support systems, the interrelationship of these systems, and the compatibility of these programs with broader development policies. In total, 92 organizations associated with small enterprises were examined and 3246 enterprises from various industries were studied.

WHAT IS SMALL?

There is no uniform definition of small enterprises. Financiers, for example, tend to define small enterprises by the upper levels of fixed assets or net worth. Labour officers define small enterprises by the number of persons employed, traders by the sales volume. Service personnel look to the total number of customers served, manufacturers to the maximum levels of energy required for total production.... Although no single definition can realistically include all criteria, two seem to be used more frequently than others: the number of persons employed, and the size of fixed assets or investments. In the IDRC-supported project, the employment criteria was used by all seven

country-teams, although not exclusively. Small enterprises in fact vary from country to country, and may vary within each country, from sector to sector. Smallness is related to the rate and level of economic development of a country and the criteria are, therefore, always changing.

During the past decade the small enterprises sector expanded in the seven Asian countries under study and contributed significantly to their respective economies. Within the manufacturing sector alone, small enterprises, on average, comprised 90 percent of establishments, provided 40 percent of employment and contributed 25 percent to the total value added (the difference between the value of goods and the cost of materials or supplies used in producing them). In Hong Kong, the number of small enterprises in the manufacturing sector rose from 23 to



40 percent. A similar pattern is noticeable in other countries.

Notwithstanding the contributions made by small enterprises, findings from the IDRC-supported study indicate that they do not receive proportional attention from policymakers and donor agencies. Uncoordination and ambiguity pervade policymaking. Meanwhile, small enterprises suffer from such problems as small markets, capital shortages, insufficient marketing support, lack of market intelligence, limited managerial and technical capacity, inadequate supply of raw materials, conflicting and sometimes discriminatory government policies, and labour shortages.

It is said that small enterprises are too numerous and too complicated for the bureaucrats and technocrats. Granted, they face both psychological and logistical barriers in organizing and offering assistance and support to numerous small enterprises in various sectors. Most aid agencies have a tendency to

industrialized countries also prefer large projects, for the simple reason that the technology for transferring to these projects is already available and, secondly, they are much easier to handle from international scientific, technological, and logistic points of view.

While, in some Asian countries, small enterprises are often confused with cottage industries, in others they are regarded as an inevitably backward and lagging part of the economy. In most development programs, too little attention has been paid to the benefits to be gained by helping existing small enterprises to modernize, and by stimulating the growth of new modern small enterprises. It is necessary for policymakers in some Asian countries to realize that small enterprises have problems and difficulties distinct from those of big enterprises and industries, and solving these problems and difficulties requires appropriate policies and programs. It must be realized that small enterprises need not be backward, primitive, and inefficient. Like the big enterprises, they can be efficient, modern, and economic.

STRATEGIES FOR PROMOTION

Once the psychological barriers are overcome, the next problem in small enterprise development programs is to achieve clarity and congruence of objectives and strategies. Very few countries in Asia seem to have achieved this.

Three kinds or layers of measures seem critical. The key word in developing strategy for small enterprises development is *selectivity* — at the environmental, sectoral, and individual enterprise levels. The first involves the creation of a favourable climate through activities to stimulate development and remove various constraints (such as taxes, investment policies, etc.) that discriminate against small enterprises. The second deals with the promotion of specific industries as deemed appropriate at a given point in time. Here, policymakers and administrators are advised to clearly identify sectors where small enterprises can be encouraged, gradually eliminated, or preserved at a reduced level so that the various measures such as tax privileges, favourable credit terms, export subsidies, and subcontracting can be accordingly manipulated. This exercise is an ongoing activity and in countries with fragmented and isolated markets, and decisions may have to be related to different regions. The third layer of measures is aimed at individual enterprises and entrepreneurs. Government strategies here should seek to adopt a package or cluster approach, depending on varying needs of specific enterprises, including finance, technical guidance, marketing, raw materials, and managerial assistance.

The most important requisite in the promotion of small enterprises is a steady supply of entrepreneurs — peo-

The imbalance between small and big industries results in wastage, unemployment, inequitable income distribution, and other problems.

take risks with their personal experience and savings. Some countries are assured of such a supply, partly as a result of the ethnic characteristics of their people, and partly the result of well-designed promotional programs. But there are still some countries where entrepreneurial development programs have achieved only limited success. According to the studies, the main factors that make one become an entrepreneur are previous familiarity (which brings the technical competence) with the activity concerned, some savings, and a willingness to risk job and savings in a new venture. In countries where entrepreneurs are few, it is necessary to create conditions and facilities enabling increasing numbers of persons to acquire experience in various activities, especially in those sectors selected by policymakers for small enterprises involvement.

Several policy measures can be initiated to encourage such participation. One is the apprenticeship policy, whereby a large number of individuals can obtain experience and technical competence. Another is the organization and maintenance of industrial centres, particularly in small towns and rural areas, where individuals can learn skills in an industrial-commercial environment.

Another characteristic of entrepreneurs

has been a migratory nature. For instance, most of the entrepreneurs in Hong Kong are migrants from mainland China. In many countries, the urban informal sector is composed mostly of migrants from rural areas. The lesson one learns is that small enterprises will benefit if mobility and migration can be increased and managed in such a way that people move to places where opportunities and demand exist for their skills and products. But using migration usefully to promote small entrepreneurs is a complex and tricky job. In some countries — Malaysia, Sri Lanka, the Philippines, Indonesia — there may be considerable scope for migration, but there may not be sufficient demand. On the other hand, in countries where there is not much scope for new settlement, migration tends to lead to overcrowding in metropolitan areas.

Once individuals are willing to use their technical competence and savings to start enterprises, various public and private agencies can offer support services — finance, technology, product testing, marketing, and management.

The utilization of these services by small entrepreneurs varied in the countries studied. Several problems hindered their utilization. Awareness of the availability of these services is limited by the socio-cultural bias of bureaucrats, deficient organization, and

inadequate publicity. Specific measures such as offices in small towns and rural areas, more professional and extension staff, and official requirements to seek out specific target groups, should be implemented to make services and facilities known. Even when the services are known, it was found that their utilization is restricted by such problems as paperwork, collateral requirements, and inappropriateness of services offered. It is necessary that a close examination be made and necessary corrective measures be taken to ensure that the services are utilized by those for whom they are intended.

ORGANIZING FOR DIVERSITY

It is common knowledge that individuals and agencies with similar interests can better protect their interests against competing interests if they are organized. Small entrepreneurs, like small farmers, need common and co-operative organizations so that they can safeguard their interests and obtain the same economic benefits as large-scale operations, such as bulk purchase and sales. Yet small entrepreneurs are the least organized.

Usually, three types of organizations seem to benefit small enterprises. The first, based on a specific activity or trade or according to location, is needed to represent the interests of enterprises offering similar products and/or ser-



vices, or within a given territory, be it county, city, province, or nation. Another type of organization, such as cooperatives, formed either locally, regionally, or nationally, will enable small enterprises to purchase supplies in bulk, organize bulk sales of outputs and similar economic activities. The essence of these organizations is that small enterprises can carry out large-scale operations in purchasing, production, and sales. The third type of organization required by small enterprises is the provision of services such as training, technical guidance, management assistance, etc.

A QUESTION OF BALANCE

Studies have shown that there exists considerable imbalance between small and big industries in many developing countries. As a result, there is considerable wastage, unemployment, inequitable income distribution, and other socio-political maladies. It is thus very important for policymakers to realize that in their planning for economic development, and especially planning for industrial development, special considerations must be given to this balance of small, medium, and big enterprises in specific sectors and even specific areas of the country. Promotional policies should also be arranged in such a way that they are compatible with the overall policies.

The similarities between small enterprises and small farmers are such that the experience in promoting one can be relevant to the other. For example, small enterprises, like small farmers, are numerous and are always weaker than their large counterparts when demanding services or benefiting from the economy. They need greater attention, more selective services, and stronger organizations. The organizations and extension agents selected for assisting small enterprises and small farmers must have a genuine understanding, empathy, and commitment to their clientele. Efforts to modernize their operations so that they can remain competitive must be on-going. No less must public policies reflect a greater sensitivity to the interests of small enterprises and small farmers.

Programs for development and modernization of small enterprises and small farmers must proceed simultaneously in developing countries if the critical problems of unemployment, inequity, and poverty are to be resolved. Small farmers and small enterprises provide the vital links between agriculture and industry, and the development of one without the other will not be very productive. It is only by emphasizing the role of both in a strategy for development that high growth rates can be made compatible with better income distribution and with the generation of a larger number of productive sources of employment — growth with equity. □

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THE CHAINMAKER

The story of Mr C is typical of many of the small entrepreneurs studied in the course of the IDRC project on small and medium manufacturing enterprises. The specific circumstances of the case history of Mr C's enterprise have been changed to protect his anonymity.

Mr C, the owner of Asia Chain Ltd, was born in 1930 in the capital city of the Southeast Asia country to which his parents had migrated from China 50 years previously. Leaving school at 18 with six years of secondary schooling, Mr C first helps his father run a canned food business. Four years later, he goes into business for himself by importing a car from Germany with money he had saved and borrowed from family. Mr C continues as a car importer for three years. The large capital requirements for this kind of business are too great for him, however, and so he moves on to selling motorcycles. The motorcycle dealership prospers for five years until Mr C's import agent loses the distribution franchise. The mechanical experience gained in dealing motorcycles and importing cars leads him into the spare parts trade.

Three years later, a friend proposes that he and Mr C go to work in Japan, buying, repairing, and reselling old machinery. Now about 33 years old, Mr C works in Japan for eight years. On his return, another friend tells him the home market is crying for motorcycle parts. And instead of importing them, the friend advises, Mr C should look into manufacturing them, thus avoiding transportation costs, and taking advantage of cheaper domestic labour and material costs — as well as lack of local competition.

In 1972, Mr C builds a factory on a piece of land rented for 25 years from the government's Industrial Estates Directorate (IED). His capital totals about \$us100 000. Labour is readily available and both electricity and water are provided. Thus Asia Chain Ltd opens its doors with about 50 workers and four technical advisors.

Motorcycle chains require precision manufacturing to fairly high standards. Asia Chains' first lots are returned because of poor quality and poor wearing performance. Even with the help of experts from Taiwan, Mr C cannot solve his quality problems. On the point of closing the factory, he decides to acquire the necessary skills himself. After a training course in Taiwan and personal study he is able to revamp operations to achieve the required standards.

At present, about 90 percent of the products manufactured at the factory are bicycle chains, and most of his customers are assembly fac-

ories and repair shops. Mr C plans to manufacture rims, spokes, stands, and handlebars for both bicycles and motorcycles and has been importing the necessary machinery.

Mr C's first contact with government promotion programs comes when he registers Asia Chain Ltd as a small industry with the Ministry of Trade and Industry. He learns that small entrepreneurs can receive government assistance in the form of capital, available through the Small Industry Loans Authority (SILA); technical and managerial extension services from the Industrial Service Bureau (ISB); and factory sites and facilities from the Industrial Estates Directorate (IED).

He requests a \$50 000 loan from SILA to undertake his expansion program, and arranges for loans and a credit line from commercial banks for about \$275 000. SILA spends an inordinately long time considering his request, and must make several appraisals of his operations in the process.

The technical assistance offered by the ISB falls short of Mr C's needs and expectations as it is unable to help him improve his precision techniques. When he had a problem with chrome plating, ISB is only able to advise on general plating principles that prove inappropriate.

Mr C complains of having to pay bribes whenever conducting business with government agencies, and chafes under bureaucratic constraints. Once he is invited to be a member of the government standard inspecting committee to inspect bicycle chains, but feels that the standards adopted are more appropriate to a highly developed industrial country. He quits the committee, maintaining that if the domestic product reaches as high as 95 percent of the foreign standards it is more than satisfactory. Mr C plans to organize an association of all the factories in the industrial settlement where he is located. A common front is needed to solve some of the institutional problems small enterprises face, he feels, and a managing director representing all the factories could establish better working relationships with the various agencies and officials and cut through red tape.

Though the ups and downs of his undertakings may seem precarious, like many other entrepreneurs, Mr C is convinced that being someone else's "wage slave" is a much more uncertain way of making a living.

ROWAN SHIRKIE

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farmers in Uruguay and
strengthened cooperative
action*

FARMER-TO-FARMER COMMUNICATION

SUSANA AMAYA

Everything was going pretty well in the association El Espinillo until the other day, at the meeting of the executive board, when....

Miguel: Well, we've got a general meeting coming up.

Santos: That's right. Man, how time flies! Another year gone and it's time to hold another election.

Miguel: Yep. So we have to make up the list of candidates for new officers.

Juan: The list is always a bit of a headache, isn't it?

Miguel: No, not really. It just takes a minute. No need to hassle. Come on, Santos, get some paper and a pencil and let's get started.

Juan: Put the list of offices on one side — president, secretary, treasurer — and then we'll see who to put down for them.

Santos: Ready. Let's start. Vicente, what do you want to be this time — president or secretary?

Vicente: Me? Don't put me down for anything. If I have to be something, then let it be an alternate.

Miguel: You can't mean that!

Vicente: I do mean it, and I'm serious. I've been telling you for the last two years to get someone else. I'm getting tired, I've done my part. I've been working with this group for more than — well, let's see — for more than 10 years. First president, then secretary, back to president, and then secretary. It's time someone took my place! I'm retiring.

Juan: But you can't! You can't retire! What's going to happen to the associa-

tion without you? We need you really badly, Vicente. You're the key man!

Vicente: That's just the problem. There's only a few of us who do everything. What about the rest of the people? An association can't work like that; it can't make any headway... any progress. It comes to a standstill and stagnates. That's where we've gone wrong.

Miguel: But is it our fault if the others don't...?

Vicente: A rural development association has got to have everyone's help and cooperation if it's going to work. If it doesn't, then where's that famous cooperative spirit, that union of people we wanted to form? No, we have to throw it open, share, find new people, call on others, and...

Santos: But what others, Vicente? Who are you talking about? You know perfectly well there are only a few of us on the committee. The ones who do all the work, get things moving, who really look after the association... you can count them on the fingers of one hand, and you'll have a few fingers left over!

Miguel: If a couple more people decide tonight to do the same as you, Vicente, we can say "goodbye Rural Development Association of El Espinillo"!

Vicente: And the young blood? Where are the young people?

Juan: Oh, you know. They never show their noses around here!

Vicente: Then we'll have to find a way to get them in here.

Juan: We've tried that before.

Vicente: But we haven't succeeded, so we'll just have to keep trying. Lots of people live in this area, and we have a lot of members.

Miguel: Yeah, sure there are plenty of members on the roll, but when it comes to showing up at meetings...

Vicente: But we can't let that happen. That's what we've got to change. That's the reason I don't want to be on the executive anymore. First of all, I'm tired. And then I'm not sure if we're doing the association more harm than good by always being the officers. We need new blood here, young blood.

Juan: Young blood? Where are we going to find that?

This conversation never took place, although it might have. It is a taped dramatization distributed to groups belonging to a cassette forum project experiment run in Uruguay in 1977 and 1978.

This novel experiment attempted to introduce and evaluate a type of intermediate communication technology with groups of farmers, and between these groups and the leaders of the cooperative association to which they belonged. The experiment, supported by IDRC, aimed to contribute to the development of the small farmer through cooperative activities. The cassette forum was chosen because a rural communication service must have simple, inexpensive equipment. Requiring only a small recording studio, portable recorders for the production team, uncomplicated and hardy portable re-

corders for the groups, and a regular supply of 60-minute cassette tapes, the method seemed ideal.

The cassette forum works quite simply. A group of people listen to tapes on a portable cassette player; after listening, they discuss what they have heard and tape their observations on the unrecorded part of the tape. Once returned to the main production centre, the comments, suggestions, and responses of interest to all experiment participants are incorporated into a new message.

The experiment was conducted in the southern part of the country where there are mostly small fruit and vegetable farms. Some work was also done in the grain-growing western zone. The participating farmers were all members of cooperative associations, and for the purposes of the cassette forum experiment, they were placed in relatively homogeneous groups.

The Agrarian Cooperative of Rural Development Associations (Cooperativa Agraria Ltda de Sociedades de Fomento Rural), known as CALFORU, has concentrated its activity in production and export programs in the southern part of the country. Since 1960, CALFORU has handled the integrated commercial activity of the local cooperative associations. A part of Uruguay's rural development system, it brings together 200 local associations, totalling 16 000 small and medium farmers. It provides farmers with market studies, credit for inputs, technical assistance, finance, common markets that help make final prices remunerative, and an entrepreneurial structure that enables it to successfully compete on international markets. So far the most important production programs have involved garlic and onions for export.

Each local association is responsible for its regional production program and for managing this program. This requires discipline, group awareness, and a sense of responsibility. Maintaining participation and discipline is all the more difficult as the programs have been managed by the farmers themselves since 1977, through their elected committees.

Because of the isolation in which he lives, the Uruguayan farmer is traditionally individualistic. His *chacra* is his home and his place of work. As the farms are not grouped together in villages or hamlets, it is difficult to organize and integrate the small farmer in cooperative societies.

Due to the nature of its work, CALFORU is located in the capital, Montevideo, and is run by technical experts and functionaries who, as the association work grows, have become increasingly removed from local member organizations. The result was a communication problem that motivated IPRU, the Institute of Socio-Economic Development of Uruguay, to undertake the communication project. IPRU conducts studies on marginality, promotes rank-and-file organizations, and trains promoters and leaders. It has been carrying out

social and economic betterment programs in Uruguay since 1965.

The cassette forum experiment constitutes a first step towards integrating farmers into the discussion and decision-making process of the institute. In the process of doing this it teaches the farmers how to work in groups. The experiment was programed to last a year so that as much as possible could be achieved, different methods could be tried, and group permanence measured. There was one break during the summer harvest. Twenty-two cassettes were produced for meetings held every two weeks. Twelve groups — 125 people — representing member cooperative associations participated.

Each association appointed a group coordinator responsible for organizing and directing the group. Before the experiment began, the coordinators went to Montevideo for some brief training. Almost all of them were farmers or farmers' children.

CALFORU created an advisory committee for the cassette forum responsible for defining and directing topics and for obtaining and processing the

The experiment resulted in two groups taking concrete action to solve their problems.

feedback. The committee held its own meetings every two weeks and its message was produced by the production unit which also advised on communication and education matters.

The research unit was an essential part of the experiment. Prior to the experiment it conducted a topical survey among the farmers of 30 member associations. That revealed the farmer's preference for economic subjects like marketing and production. It also showed their pragmatic outlook and their limited perception of the socioeconomic situation in which they lived and its causes. These findings helped orient the first tapes of the forum. Specific topics were not established from the outset, but rather came out of the dialogue with the groups.

Getting back to the dramatization that opened this article, what in fact came out of it? There follows a long discussion on member participation and on the problem of the same people always holding office. Santos cannot forget Vicente's question: "And where are the young people?" He invites his son, Raul, to attend a meeting with him,

but Raul says that everyone at the meeting is old and that young people have no opportunity there.

Indeed, this was a problem the survey revealed, and why the cassette encourages the groups to invite young people into the associations and to train them to be future leaders. The results were surprising. One association completely reorganized its executive committee. It invited the farmers' children and organized a cassette forum with them. These young people will later replace the veteran leaders on the executive board. Another association formed a youth group for social and cultural activities, with its own production program. Thus, positive immediate feedback from two of the groups manifested itself in concrete action.

Another indication of the system's possibilities was the long-distance participation of the groups in the October 1977 Annual Congress of the National Commission on Rural Development. Before the Congress was held, the groups received two cassettes with the topics to be discussed at the Congress. Their recorded opinions and ideas on agenda items, reproduced and distributed to members of the Congress, played an important role at that meeting. The Congress also evaluated the cassette forum experiment and recommended that the program be extended to all cooperative associations at the end of the initial experimental phase, "in order to stimulate the training of capable new leaders, because the lack of leaders hinders the development of cooperative societies." Consequently this new means of communication will be permanently adopted by CALFORU and extended to reach all members.

The final evaluation of the program, carried out by the research unit, concluded that "the cassette forum was able to modify the traditionally passive isolationist attitude of the Uruguayan rural dweller." It also helped to attract young people to the associations. It not only contributed to developing and improving the ability to think and to express themselves of those participating in the experiment, but it also helped to create an inter-group awareness by placing different groups in contact with each other and by making them aware of their membership in an organization. The program also helped educate the advisory committee and a real dialogue was established with the local groups, thereby helping to explain policies and courses of action.

As the president of one of the cooperative associations summed up the impact of the program: the local farmer "who speaks up, talks into the recorder microphone, and knows how to express his ideas, is a new leader-in-the-making who is essential for our future." □

Susana Amaya, formerly Associate Director of IDRC's Communications Division in Bogota, Colombia, is now a member of the Information Division of the International Centre for Tropical Agriculture (CIAT) in Cali, Colombia.

GRAIN MILLING AND TRADITIONAL MEDICINE FEATURED IN **TWO NEW FILMS**

AN END TO POUNDING

Providing acceptable food in developing countries can be as important as supplying it in sufficient quantities. If people will not eat a particular crop because it does not taste right, or is difficult to prepare, then even the best of bumper harvests will not improve diets.

An end to pounding is a 15-minute colour film that tells the story of two projects in Botswana, Africa, that tackle the problem of turning locally grown grain into economical, convenient food for consumers.

Sorghum is a major staple crop in Botswana, as it is in many semi-arid countries of the world. Although very well suited to the climate and agriculture of Botswana, sorghum has become less suited to the changing lifestyles of the people.

The rough outer hull of sorghum is removed before the grain is made into meal or flour and subsequently eaten. The traditional way of removing the hull — by hand, pounding with mortar and pestle — is laborious,

lengthy, and wasteful. As a result, people are turning away from locally-produced sorghum to other grains that can be bought in convenient, ready-processed forms. The trend has aggravated problems in an already troubled food system.

The film follows research in Canada and Africa that has recently produced a novel mechanical dehuller that can process sorghum quickly and cheaply. The dehuller is also adaptable to millet, cowpeas, chickpeas, maize, and other cereals and legumes common to the semi-arid tropics. This machine may bring benefits to both consumers and producers that range beyond the solution of a particular problem.

The film should interest anyone involved in grain milling or small-scale industries in developing countries, as well as general viewers. A recent publication — IDRC-152e *An end to pounding: a new mechanical flour milling system in use in Africa* — can be used in conjunction with the film for more detailed information.

MESSAGE OF THE AFRICAN HEALERS

Traditional medicine, especially as it is practiced in Asia, has been the subject of many publications and a number of films over the past few years. In comparison, however, very little serious filming has recorded traditional medicine in Africa.

Message of the African healers is an attempt to make up for this lack. Made up of two distinct parts, this half-hour film begins by showing scenes from the daily lives of healers and patients in a psychiatric village in the Ubangi region of Zaire. The second part presents an excellent overview of the Zebola therapy, an ancient treatment still extremely popular, particularly among women in Kinshasa, the capital of Zaire. The film highlights the contribution of traditional therapy in dealing with disorders of a psychiatric, rather than a physical, nature.

According to the Director-General of the World Health Organization (WHO), Halfdan Mahler, the contribution of traditional healers, midwives, and

herbalists is essential to making good health services accessible to all. *Message* shows that where psychic illnesses are concerned, African traditions not only contribute to arriving at valid solutions, but could also provide a model for Western psychiatry, which divorces the physical from the psychic aspects of illness. The film also shows how African culture supports the ill by not cutting them off from the rest of society.

Produced by the IDRC, the film is a synthesis of two films — *Zebola: possession et thérapie* (Zebola: possession and therapy) and *Mbindo Lala: un hôpital en forme de village* (Mbindo Lala: hospital and village) — originally made by researchers at the Zaire Institute for Scientific Research in cooperation with the national television company as part of an IDRC-financed research project on traditional medicine in Zaire.

For information on loans and purchases, contact the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9

NEW PUBLICATIONS

Fisheries and aquaculture in the People's Republic of China, G.I. Pritchard. Published in May 1980, 32 pages, IDRC-115e.

This publication, based on an analysis of the open literature and a trip by the author to the PRC in 1974, examines Chinese fisheries practices and their supporting sciences in relation to national goals and priorities. It covers the fishing industry and its resource base, current approaches to scientific research and its transfer, the present status of freshwater and marine research, and provides a general assessment of the fisheries and the future outlook.

DEVINDEX 1978. Index to 1978 literature on economic and social development. Index de la littérature sur le développement économique et social produite en 1978, Gisèle Morin-Labatut, editor/rédactrice. Published in May 1980, 183 pages, IDRC-149e,f.

The fourth volume in the IDRC DEVINDEX series contains 519 entries from Canada, the Federal Republic of Germany, Indonesia, Morocco, the Netherlands, and the USSR. The main bibliographic index, arranged in six categories, is followed

by subject, geographic, institution, and author indexes.

Wastewater treatment and resource recovery: report of a workshop on high-rate algae ponds, Singapore, 27-29 February 1980, Lee Boon Yang, Lee Kam Wing, Michael G. McGarry, and Michael Graham, editors. Published in May 1980, 47 pages, IDRC-154e.

This publication gives an



account of research aimed at developing high-rate algae ponds as a method of low-cost wastewater treatment and reclamation of nutrients in the form of reusable by-products. A summary of progress to date and abstracts of papers presented at the workshop are given. Also included are a list of participants and a bibliography.

Rattan: a report of a workshop held in Singapore, 4-6 June 1979. Published in May 1980, 76 pages, IDRC-155e.

This report is the product of a workshop that brought together specialists from seven Asian countries to discuss and revise a state-of-the-art review of research and commercial exploitation of rattan.

Information on collection, processing, and trade, as well as priorities for future research are presented: included are a list of participants and a bibliography.

International cooperative information systems: proceedings of a seminar held in Vienna, Austria, 9-13 July 1979. Published in May 1980, 111 pages, IDRC-156e.

This publication presents 16 papers reviewing experience with various international cooperative information systems and networks, specialized systems and services, and computer programs for information processing. It



offers suggestions for harmonization, evaluation, and utilization of these systems in order that they may better contribute to meeting the information needs of developing countries.

SALUS: low-cost rural health care and health manpower training — an annotated bibliography with special emphasis on developing countries, volume 6, Rosanna M. Bechtel, editor. Published in June 1980, 160 pages, IDRC-153e.

This is the sixth volume of

a series of bibliographies that compiles and coordinates information, both published and unpublished, on non-traditional health care delivery systems. The focus in the current volume remains on new models of health care delivery and the training and utilization of health workers.

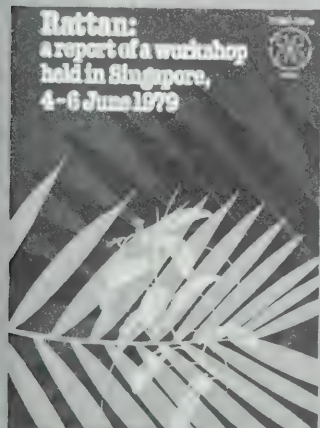
Science and technology for development. STPI Module 1: a review of schools of thought on science, technology, development, and technical change, prepared by Francisco Sagasti et al. Published in June 1980, 56 pages, IDRC-TS18e.

This publication is the first of a series of 12 modules containing supporting material for the findings and assertions made in the Main Comparative Report of the

Fisheries and Aquaculture in the People's Republic of China
G.I. Pritchard



Science and Technology Policy Instruments (STPI) Project (IDRC-109e), a large research effort that examined the design and implementation of science and technology policies in 10 developing countries. The module discusses different approaches to the study of technology, industrialization, and development, as well as their policy implications.





INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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International Development Research Centre
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Reports

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CANADA

**SPECIAL
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10 years**

LETTERS

April Reports

I found myself reading nearly every item of the April issue with interest. The ten predictions of the *New Internationalist* are stimulating discussion-starters. It took Dr El-Sawy an unconscionably long time to get the damssisa plant accepted to fight bilharzia. One wonders how many other good answers to unsolved problems are held back by the 'tyranny of the status quo'. Dr Laquian in "Jambo" was able to break the shackles of the conventional wisdom.

As an amateur propagandist for birth control over many years, I liked your emphasis on age at marriage in "The family factor". I have always found it a common ground-starter with church leaders. I first used it about 15 years ago with the Archbishop of Costa Rica who pushed it and *paternidad responsable*, so I feel much in tune with your article.

I have been to Bangladesh, but not seen before your figures for higher death rates for girls under five. What a shocking corroboration of the masked infanticide which has been so hard to put a figure on!

Rupert Buchanan
St. Catharines, Ontario
Canada

Women's status

As someone somewhat concerned with feminist issues in education and science, and as a visitor to Turkey where I have lectured and been a consultant on science policy, I am curious about the Turkish data referred to in "The family factor" (April

1980). You may not know, but Turkey is a peculiar pathological instance in statistics of professional females. It has, in fact, the world's record largest proportion of women in university faculties, and even a near equality of women with men in full professorships.

I was long curious about this phenomenon in a very non-liberated country, until I discovered it was partly due to a prejudicing Atatürk revolution against letting women into Jewish-dominated businesses and male-dominated trades. The only places the women could go were the higher professions, especially education. Furthermore, the large proportion of peasantry in the cities gave Turkey a larger access to servants and babysitting than in most other developing countries. It follows from this that you can't always trust the statistics to tell you about the true status of women.

Derek de Solla Price
Avalon Professor of History of Science, Yale University
New Haven, Connecticut
USA

New journal

Reports readers may be interested in the *Canadian Journal of Development Studies*, a forum for encouraging the dissemination of new ideas and alternative strategies in all fields of development studies.

The first issue of the bi-annual *Journal* was published in May 1980 by the University of Ottawa Press. It is designed to serve scholars and professionals engaged in

development studies in Canada and developing countries, and is particularly focused on the policy applications of innovative theory and research for the promotion of international development, and the role of countries such as Canada in fostering a more equitable world order.

We are now calling for papers and subscriptions. Preference will be given to thought-provoking papers based on empirical research, field work, or case studies having significant implications for development planning and policy in the following problem areas: poverty; basic needs; regional disparities; agrarian reform; unemployment; technology transfer; population; manpower and educational planning; development administration; trade; aid; and industrialization.

While English and French are the principal languages of the *Journal*, papers in other languages may be published occasionally.

For information, please write: International Development Studies Group, Institute for International Cooperation, University of Ottawa, 190 Laurier East, Ottawa, Canada K1N 6N5.

Maxime A. Crener
Ozay Mehmet
Co-editors

Canadian Journal of
Development Studies
Ottawa, Canada

Hope for change

What a wretched world this is that so many people have to depend on cassava

to survive. Not only does it appear to be poor in protein and vulnerable to the attacks of insects and diseases, but now it is implicated in goitre and mental deficiencies.

I think your organization deserves credit for efforts to improve the crop, but I wonder if people in the Third World aren't still being gypped somehow. Why should they have to eat what is a pretty poor potato, no matter how much it is improved, while the rest of us grow fat on meat and wheat?

And it's hard not to be cynical about aid when Barry Nestel traces the origins of Canadian support for work on cassava back to the opposition of grain producers in this country to other plans that might have bolstered Third World cereal production.

But I guess miracles are still possible in a world where ex-Chancellor Willy Brandt and his fellow ex-heads-of-state on the Brandt Commission can become "born-again" development believers. After all, they were pretty determined to side-step the problems when they were in power and could have done something about them. Maybe there is hope for change yet.

Linda M. Kulesha
Willowdale, Ontario
Canada

Letters from readers are welcomed, and should be addressed to:

*Editors, IDRC Reports,
PO Box 8500, Ottawa,
Canada K1G 3H9*

Reports

THE IDRC

The IDRC Reports and companion editions *CRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 85, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michèle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Shelly de Feferbaum. *Staff photographer*: Neill McKee.

CONTENTS

Biotechnology: promise . . . and peril	How can developing countries benefit from the new techniques that tinker with living organisms? Jean-Marc Fleury and Rowan Shirkie report.	4
A problematic success story	Moving biotechnology out of the lab and into the field is not an easy task, as Rowan Shirkie explains.	7
Briefs	A quick scan of development news and trends	8
Special report: IDRC's first 10 years	The inaugural meeting of IDRC's Board of Governors took place October 26, 1970. In the 10 years since, the Centre has supported close to 1000 projects in over 100 countries. In our Special Report, "10 years for tomorrow":	9
	• Rex Nettleford retraces the Centre's origins and evolution;	10
	• Ivan L. Head looks to the next decade;	13
	• four developing-country journalists visit Centre-supported projects (pages 14, 16, 20, and 22);	14
	• the Regional Offices describe IDRC in their regions;	18
	• and Abdus Salam talks to developing-country scientists.	24
Rebuilding Zimbabwe	Human and physical resources are equal to the task that Zimbabwe has set itself, says Clyde Sanger.	25
Organizing for change	An interview with Eddison Zvobgo, Zimbabwe's Minister of Local Government and Housing.	27
Filmmaker's notebook	Neill McKee steps from behind the camera to observe a waste reuse project at Lake Atitlan, Guatemala.	28
New releases	Films and publications	30



Cover: Caqueza, Colombia. Improving the well-being of the rural poor has been a focus of IDRC-supported projects during the Centre's first 10 years. This emphasis will continue in the coming years. Our special report, starting on page 9, reviews some of the work accomplished to date and looks ahead into the 80s.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 30677, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogotá D.E., Colombia); and the Middle East (7 Aflaton Street, P.O. Box 685, Heliopolis, Cairo, Egypt).

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There are no secrets, but developing countries must now appropriate the new techniques if they are to benefit

BIOTECHNOLOGY: PROMISE...AND PERIL

JEAN-MARC FLEURY AND ROWAN SHIRKIE

A new technological revolution has begun. Newly evolved techniques for the genetic manipulation of simple organisms like bacteria, yeasts, and fungi have enabled scientists to change the functioning of living things to make them more useful to humans.

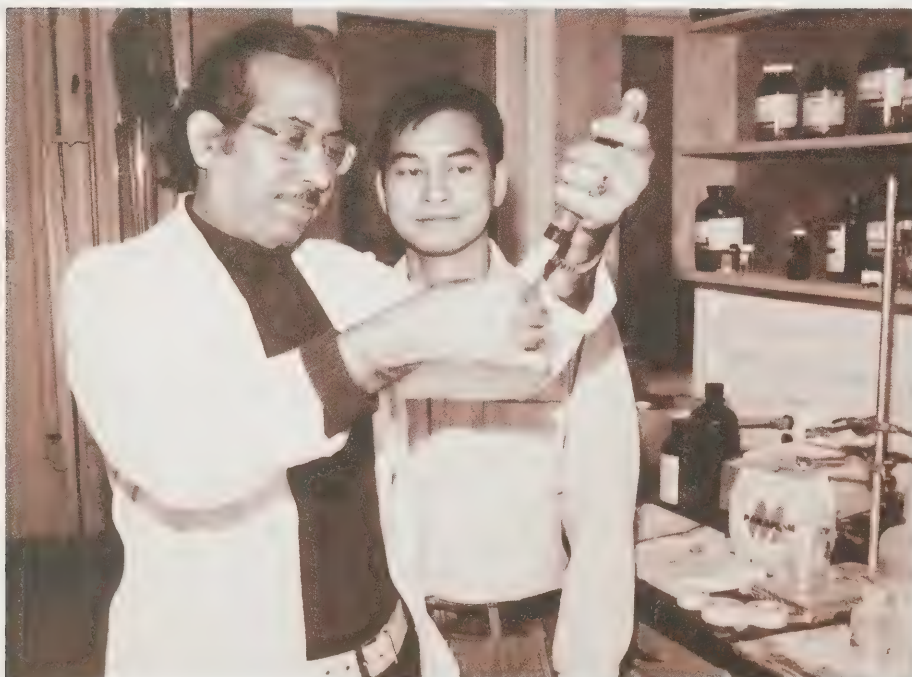
The power of the technique lies in the recently acquired ability to alter the "genetic blueprint" of DNA. DNA (deoxy-

ribonucleic acid) is the complex molecule in which all the information required for the creation and operation of each cell in an organism is coded in units called genes. By selecting genes responsible for a particular product in one organism and recombining them in the DNA of another, biochemists can create a "bug" specifically to manufacture the desired product.

Used to attack disease through new therapies, or improve industrial processes and produce new products from new resources, this biotechnology will have far-reaching consequences. Something almost as extraordinary as the unfolding of a second industrial revolution, based as much on biotechnology as on micro-electronics, is possible. Developing countries can grasp the opportunity presented by biotechnology and turn it to their own benefit.

"There are no secrets," says Dr Saran Narang, molecular biologist at the National Research Council of Canada, and one of the world's leading researchers in the field. "It's not like nuclear technology where you need complex hardware like a reactor, and uranium from foreign countries. It is simple biochemistry. Every country has the facilities; all it needs is the training. Our university undergraduates will be using the techniques next year." But in order to take advantage of the genetic technology, he says, developing countries must first be alerted to its potential and begin to acquire the critical skills that will be needed in the future. The achievements of basic research must still be translated into useful products, and the move from the laboratory to successful application is by no means as simple (see box, page 7). "That is where the work must now begin," says Dr Narang.

In fact, developing countries already have a tradition of biotechnology that reaches into households and industry. The controlled action of microorganisms



N.R.C.

Biotechnology is simple biochemistry for which all countries have the facilities, says Dr Saran Narang (left). Training is required, however, to take advantage of its potential.

to preserve or process food becomes more familiar when the products are mentioned: bread, cheeses, beer and wine, yoghurt, and pickled vegetables. Fermented meat-substitute foods such as tempeh and tofu are widely consumed in Asia, and soy sauce spices dishes around the world. They are the result of refined microbial processes. Japan has built on its traditional fermentation industry to produce the industrial chemicals and enzymes, vitamins, antibiotics, and alcohols that are now responsible for six percent of its income. Intensifying the natural decomposition of organic material — waste treatment — is the world's largest microbiological industry.

All of the conventional microbial processes now in use stand to be improved and made more efficient by biotechnology. The near future will also see the development of many novel applications.

Much of health science concerns itself with the harmful or healing properties of microbes. Living in perpetual competition with each other, microbes defend themselves by secreting antibiotics... which humans extract on an industrial scale to protect themselves, in turn, against bacterial infections. The pharmaceutical industry is also developing bacterial enzymes to dissolve blood clots, clean burn tissue, or facilitate digestion.

But with the progress of genetic engineering, pharmaceutical biotechnology borders on the spectacular. In the space of two years, geneticists have taken an innocuous bacillus from our intestinal flora, *Escherichia coli*, and made a "microfactory" producing medications worth billions of dollars. *E. coli* are now made to produce insulin, growth hormones (for treating dwarfism), beta-endorphin (a substance secreted by the brain to reduce pain), and interferon (the first anti-viral medicine, which may prove effective in fighting cancer).

Genetic engineering also opens the door to completely unprecedented vaccines, including one against the most widespread of diseases, malaria.

AN ANTIMALARIAL VACCINE

One billion people are exposed to the malaria parasite and, rather than improving, the situation is getting worse. The mosquito that transmits the disease is developing an increased resistance to insecticides, and the parasite itself has grown more tolerant of drugs. An antimalarial vaccine would be virtually the only hope in many regions where the infection appears to be permanently entrenched.

Efforts to develop a malaria vaccine have failed because the malaria parasite undergoes several different transformations in the human host. Up to now, it has been impossible to identify a specific substance from the parasite that could be used in a vaccine. But recently, one of the new biotechnology techniques has permitted the identification of a molecule from the parasite's early stage that successfully stimulated

the immune system.

The chemical synthesis of this large molecule, which would be required in large quantities for a vaccine, is impractical. The gene responsible for the molecule production could, however, be inserted in *E. coli*. And according to Ruth Nussenzweig, of the New York University Medical Centre team researching this approach, there is no solution *other* than engineered bacteria for the large-scale production of the new malaria vaccine.

While waiting for the malaria vaccine breakthrough — which may come about sooner than expected — genetic experts are already busy producing other important vaccines. British, French, and American teams have introduced genes from the hepatitis B strain into bacteria, an important step in the development of a vaccine against the most pernicious form of hepatitis. In Montreal, researchers at the Institut Armand-Frappier are trying to perfect vaccines against rubella (german measles) and poliomyelitis, having already created a new vaccine against influenza containing antigens that will be manufactured in recombinant bacteria.

Still in the field of vaccination, in western Canada at the University of Saskatchewan, George Khachatourians is working on a vaccine against cholera, using "minicells" — another new biotechnique. Khachatourians creates the minicells by selecting a mutant strain of *E. coli*, into which he introduces genes from the pathogenic agent. When the mutant divides, instead of producing the usual two identical cells, it forms a large and a small cell. The pathogen antigens are carried on the surface of the small cell or minicell, but the cell itself has no internal genetic material, so it cannot reproduce. The risk of infection is thus eliminated, although the production of antibodies is still highly

stimulated. These minicells augur well for the development of a more effective vaccine against cholera.

BIOMASS FUELS

Along with health, one of the most pressing contemporary concerns is energy. Biotechnology is at work here, too, as alcohol fuels from organic sources rapidly gain acceptance as an economical alternative to petroleum. Alcohol fuels can be produced from sugar or starch crops using yeasts that ferment simple sugars to ethanol. Using largely conventional techniques, Brazil plans to become self-sufficient in automotive fuel by brewing alcohol from sugarcane. Advanced techniques now appear to bring a similar measure of independence within reach of many countries.

Sugar crops like cane and beet need only to be pressed and mixed with water to yield the fermentable sugar units for alcohol distillation. But the sugar units are linked in long branched chains in starch crops such as corn and cassava. High process heat and expensive industrial enzymes, or an acid solution, must first be used to liberate the sugar before yeasts can feed on them. This multiple-stage processing raises costs and, by most analyses, makes fuel production from starch crops uneconomical unless subsidized against petroleum.

If the work of biochemists like Dr. Illmar Altosaar of the University of Ottawa, Canada, is successful, the bacterial genes for amylase — the enzyme responsible for converting starch to sugar — may be transferred to yeast. Ethanol production then becomes significantly simpler and cheaper. Other research in Europe concentrates on developing a "superbug" 40 times more efficient than present microorganisms for use in the Brazilian ethanol program. The approach attempts to improve the amylase enzyme activity, and increase the capability of selected bacteria to grow at high heat. The superbug will be an efficient organism that operates at the evaporation point of ethanol (70 °C), skipping yet another conventional process, the distillation to purify and concentrate ethanol. Production becomes one smooth, simple, continuous operation involving a minimum of energy and hardware.

Perhaps even more potentially useful is work on the improvement of fermentation processes for cellulose materials such as crop wastes and wood. Cellulose is the main component of plant biomass, the skeleton of cell walls in stems and leaves. As such it is strongly resistant to degradation, and the chemical bonds holding cellulose sugars are much stronger than those of starch. Conversion is possible only by a combination of high heat and pressure, together with acid. Efficiencies are poor. Cellulose represents only about 50 percent of the biomass; the rest, equal parts of hemicellulose and lignin, is not used in normal distillation. Engineered cellulase enzymes that



Biotechnology at work in a brewery in La Paz, Bolivia.

Jack Redden

THE GENETIC MECHANISM

All living organisms are built around large molecules that have been called "the ultimate parasites", but that most scientists name DNA, for deoxyribonucleic acid. The information required for the creation and operation of every cell in an organism is encoded in DNA units that are called genes. A virus has 10 to 50 genes, a bacterium has several thousand and a human cell has tens, if not hundreds, of thousands. Trying to find and use a specific gene in a complex organism would be like looking for one particular book in a library filled with thousands of volumes without titles or labels... if it were not for the remarkable shortcuts of genetic engineering.

Briefly, genetic engineering involves three main operations: cutting DNA into its constituent genes using molecular shears known as restriction enzymes; reassembling the genes in different combinations (called recombination); and introducing the recombinants into living cells.

Recombination generally links a gene controlling the manufacture of a protein to the genetic material in a bacterium, which then adopts the foreign gene as its own and begins producing the new protein. In one type of genetic manipulation, bacteria are put into a veritable "gene soup" known to contain some of the desired genes. A number of bacteria will adopt that gene, thereby becoming recombinant bacteria, but they still have to be identified and separated out of the mix. Sometimes the substance synthesized by the new gene can be used in the search.

For example, bacteria have been exposed to genes from human cells in a search for those containing the code for the synthesis of interferon — an antiviral substance. The successful recombinant bacteria can be identified by exposing all of the bacteria to viruses. Only the bacteria that have adopted the gene for interferon synthesis will survive the viral attack. Multiplying copies of the recombinant cells — cloning — will make it easier to produce this very rare substance.

According to Saran Narang of the National Research Council of Canada — a recognized authority on synthetic gene creation — genetic recombination techniques have now been perfected. "Introducing genes into bacteria is no longer a problem. Now we have to focus on increasing the yield of the desired substances from recombinant bacteria," he says.

For developing countries, biotechnology may bring unique short-term problems

perform the necessary conversion will greatly improve the process. But, just as with starch fermentation, researchers are attempting to develop a bug that will use cellulose directly, converting it to ethanol in one step, while also making better use of the other materials present in biomass. Thus, both food and energy can be accommodated within the same agricultural system, instead of making disastrous competing demands on it as some have feared.

FOOD PRODUCTION

The new techniques will also apply to the genetic improvement of food crops as research expands to more complex lifeforms. But even now, engineered bacteria have a place in efforts to boost food crop yields.

Air is 80 percent nitrogen, yet it is lack of this particular element in soils that most often limits food production. Plants cannot use elemental nitrogen directly. It must be fixed, or combined with other elements such as oxygen, carbon, and hydrogen in a form that plants can assimilate.

The fertilizer potential of nitrogen-

fixing bacteria that live on the roots of most legume plants has been improved and exploited in recent years. Biotechnological research is attempting to isolate the genes responsible for nitrogen fixation in these bacteria and adapt them to major cereals like wheat to produce plants that are nearly nitrogen-self-sufficient.

In spite of all the expectations it raises, biotechnology will not be the great panacea. Indeed, for developing countries, it may bring unique short-term problems. Most of the research now under way in developed countries aims at the total synthesis of organic materials. Where does that leave the developing countries, whose economic mainstays are those very organic or raw materials?

Sugar is an excellent example: after petroleum, coffee, copper, and timber, it is the fifth most important export commodity in the Third World. Market fluctuations that depress and inflate sugar prices in boom-bust cycles have damaging effects on developing country economies. Current high prices, together with restrictions on artificial



Producing ethanol fuels from sugar and starch crops could provide developing countries with a new market for their crops — here, sugar cane in Mexico.

substitutes like saccharin and cyclamates, have stimulated the search for sugar alternatives in importing countries.

Most important is fructose, a simple fraction of sugar, that can be produced from starch by enzymatic conversion. Syrup with a 30 percent fructose content produced from corn is already making inroads into sugar markets. Industrial users such as soft drink manufacturers are switching to the cheaper, more secure source of domestically produced fructose. Industry-sponsored forecasts suggest that fructose will command 50 percent of the

sweetener market by 1990. Fructose is one of the fermentable sugars involved in ethanol production, and it is likely that spinoffs from alcohol research will benefit the sugar substitute program. But biotechnology aimed specifically at improving fructose production, as well as that of other sweetening agents, is advancing rapidly.

A similar prospect may be ahead for minerals such as copper, as "ore eating" bacteria in acid are used in developed countries to cheaply extract minerals from low-grade deposits that were previously uneconomical.

What it all means is a possible bubble of major proportions if the primary commodities and related conventional industries based on them are displaced in developing countries by biotechnology.

The new biotechnology holds more promise for human development than almost any other scientific advance in our history. But like other technologies it also holds many perils. For both reasons, it is imperative that biotechnology is not just transferred, but quickly appropriated by the Third World.

A PROBLEMATIC SUCCESS STORY

In addition to being a staple in the diets of millions of people in the semi-arid tropics, cassava is also beginning to provide more income as an energy feed supplement for livestock. Cassava is very efficient in converting solar energy to starchy carbohydrates in its roots, but the crop is poor in protein. Humans and animals may not thrive on a starchy diet, but to certain fungi it is the staff of life. And what is more, protein content in the mycelium — the mass of thread-like appendages characterizing certain species of fungi — can range as high as 50 percent.

The existing techniques for recovering this microbial biomass protein are too complex however, for widespread application in developing countries. So eight years ago, IDRC, the International Centre for Tropical Agriculture (CIAT) in Colombia, and the University of Guelph in Canada began a cooperative project to use fungi for converting cassava into protein-enriched animal feed.

After testing over 700 soil samples from Colombia and Canada for suitable fungi, three cultures were selected on the basis of high protein content and good animal-feeding properties. The best culture identified was an *Aspergillus* species. While the initial biological studies were under way, engineers produced a fermentor that was simple and robust.

The particular culture used in the early work was *Aspergillus fumigatus*, known to cause a rare tuberculosis-like lung infection, aspergillosis. Aspergillosis is caused when airborne spores are inhaled by individuals whose resistance is already weakened by another disease or drug that suppresses the immune system. Work was halted while the

project microbiologists used radiation techniques to create a mutant of *A. fumigatus* that did not form spores.

Work commenced again, and a pilot plant operation was started at CIAT in Colombia. A practical system had evolved around the mutant fungus, made up of elements common to local cassava starch processing (a rasper and washer) combined with the innovative fermentor and a novel harvester that separated and partially dried the fungal protein.

*Many things
intervene between
biotechnology and
its successful
application*

But harvesting created an aerosol dust of tiny bits of the fungal filaments that could produce an allergic reaction or lung scarring in workers who inhaled sufficient quantities. Operations were suspended once again, while a second search for safe, productive fungi was carried out.

This time the researchers added two additional criteria. The fungus must not be able to grow at 37 °C, the body temperature of humans, and it must be limited to an acidic

environment.

Attempts to add cold sensitivity to the *Aspergillus* mutant were unsuccessful, and it was abandoned. Another promising fungus, *Rhizopus chinensis* 180, had to be eliminated because some of its relatives were implicated in extremely serious infections.

One culture emerged that seemed to satisfy all the stringent safety requirements. *Cephalosporium eichhorniae* 152 loved acid conditions, hated all but the hottest environments. It produced a biomass with 49 percent protein, rivalling *Aspergillus*, and was well-accepted by test animals.

The search for an absolutely safe organism had produced a fungus that required very specialized conditions to live. Now researchers have to deal with the reverse side of the problem: how to keep *C. eichhorniae* alive in a process that was intended to be simple, hardy, and adapted to a rural environment.

The adjustments to the production process needed to accommodate *C. eichhorniae* and eliminate the aerosol dust may make it too complex and fragile. The fungus itself could be further improved through classical genetic techniques. If so, the researchers would also like to add the capacity to use sugar and cellulose, broadening the range of alternative raw materials for protein production.

The microbial protein project serves to demonstrate just how many things intervene between biotechnology and its application in developing countries. Its success lies as much in the knowledge gained of the problems as it does in the resolution of many of them.

ROWAN SHIRKIE

Reverse brain drain

Where do you find an international consultant, for half the usual cost, and whose criticism will be accepted? By inviting back home those scientists, engineers, or other specialists who have chosen to join the brain drain by working abroad.

First started in Turkey three years ago, TOKTEN — Transfer of Knowhow Through Expatriate Nationals — has proven highly successful and has spread to Egypt, Greece, Grenada, India, and Pakistan. China, the Philippines, and Sri Lanka will soon launch their own programs and the UNDP is now actively promoting the concept.

TOKTEN's advantages over traditional forms of assistance are that the consultant shares the language and cultural traditions of his national colleagues, easing the transfer of skills and making his criticisms more acceptable. Out of loyalty to their native land, most waive their usual high fees — in Turkey, native consultants cost half as much as other international experts — and the consultancies can be arranged much more quickly since needs and experts are identified simultaneously.

It has been found that there is a continued feedback after the consultancy ends as experts maintain contact with their national colleagues, send them literature, and arrange for fellowships and visits abroad. So acceptable is the program that, in Turkey, the first 28 consultants were judged to be among the best ever and many were asked to undertake subsequent assignments.

Drug colonialism

A mountain of useless and sometimes harmful drugs is being unloaded in the Third World, a phenomenon Dr Halfdan Mahler, Director of the WHO calls "drug colonialism".

British health workers last year launched an inquiry into the sales of drugs by developed-country multinationals in the Third World. The results, published in a Colombo (Sri Lanka) journal, *Listener*, reveal some startling facts. For example, a synthetic male hormone (Winstrol) was sold over-the-counter in Sri Lanka. Literature described tests indicating the drug had beneficial effects in promoting the growth of children under six years of age. In fact, Winstrol's serious side effects — including stunting of growth, baldness, deepening of voice, and clitoral enlargement in girls — are "virtually irreversible" according to the US Food and Drug Administration, which has banned Winstrol from sale in the USA.

The marketing companies refuse to accept responsibility as many countries have not implemented laws regulating the import or sale and advertising of the drugs. *Listener* points out that several developing countries are being bombarded by an army of unethical, profit-oriented salespersons and voluminous glossy literature that plays up the supposed benefits of the drugs while ignoring harmful side effects.

According to the WHO, some 3000 active substances are contained in the drugs being marketed. WHO, which has been in the forefront in the fight against the sale of needless drugs in the Third World, has identified only

200 active drug substances considered essential to health priorities.

Natural energy

A synthetic molecule that exactly duplicates the first step of photosynthesis in plants — the generation of electricity — has been developed by scientists at the University of Western Ontario (London, Canada).

When exposed to sunlight, the molecule — called P-Q — undergoes an electron transfer reaction to make a simple battery. This discovery is a major advance in solar energy research because it unlocks the secret of how green plants convert and store solar energy.

Dr James Bolton, principal researcher on the project, says the development of the synthetic molecule holds out the promise that a synthetic solar cell could be on the market within five years. "Before we get something commercially viable, we'll need something much more efficient in terms of electron transfer and stability of the molecule", he says.

Solar cells now available are made for the most part of silicon, purified to a very high degree. Silicon solar cells work well and have a power conversion rate of 10 to 15 percent. Reliable, they have a lifespan of 20 to 30 years. They are, however, very expensive.

Dr Bolton estimates that solar cells made from the newly discovered molecule would cost 25 to 40 times less than silicon solar cells. Mass produced, the molecules would look like a plastic film. A positive and negative lead attached to each end of the sheet would complete the connection and electricity could be produced from

sunlight

The next stage in the research will involve coupling the molecule to an electrode, thus producing a photovoltaic cell, a special kind of storage battery, something Dr Bolton says will be "moderately difficult".

Water for the 80s

Less than 25 percent of the world's rural population has access to a safe water supply, less than 15 percent to adequate sanitation facilities. Most severely affected are developing countries whose rural populations are the worst sufferers. The WHO estimates that 80 percent of all diseases are water-related, causing half of the infant deaths.

To focus world attention on the problem and mobilize people and resources to solve it, the United Nations has declared 1981-1990 "International Drinking Water Supply and Sanitation Decade".

As a means of working towards the goal of providing clean water and adequate sanitation to all by 1990, developing countries are encouraged to emphasize water and sanitation in their national development plans and commit increased resources for water-related projects. Industrialized countries are asked to provide more resources in their bilateral aid programs and increase their contributions to multilateral water and sanitation programs, as well as improve their own services.

For information contact: International Drinking Water Supply and Sanitation Decade, UNDP, 1 UN Plaza, New York, USA.

10 YEARS FOR TOMORROW



SPECIAL REPORT IDRC's first 10 years

Ten years ago, only a few people in the know were awaiting impatiently the establishment of the International Development Research Centre. But they had great expectations. Their fondest hope was that the new organization would harness more of the world's scientific and technological endeavours for the benefit of the disadvantaged of the earth. In short, they wanted to translate into a formal structure the famous saying: "Give me a fish and I will eat for one day; teach me how to fish and I will eat forever."

Today the founders' hopes are embodied in an increasing number of scientists, most of them born and working in the Third World. Despite the speed of technological advance, however, one decade is not enough

to assess whether the young organization has lived up to the task. At least it has succeeded in providing hundreds of young people — some of the most brilliant minds in the developing countries — with the means of devoting their skills to the solution of problems affecting the lives of millions of people.

The following pages, published on the occasion of IDRC's 10th anniversary, present a few achievements of these researchers who are striving to develop — or more often to re-establish — an indigenous scientific and technological momentum in their communities.

No one is better placed than they to bring the benefits of science and technology to bear on the solution of international development problems.

A HISTORY OF RESPECT

An interview with Rex Nettleford on IDRC's first 10 years

The Hon. Rex M. Nettleford, O.M., is Director of Extra-Mural Studies, University of the West Indies, Kingston, Jamaica, and advisor to the Jamaican Prime Minister on cultural affairs. A founding member of IDRC's Board of Governors, he served on the Board during the Centre's first 10 years. He was interviewed for Reports by Ian Boyne, a feature writer with the Jamaican Agency for Public Information and Sunday Sun newspaper.

Reports: What were the conditions that led to the creation of IDRC?

Nettleford: "I think it has to be seen in the context of the disappointing record of the first development decade, where the projected recipients of assistance from the developed world turned out to be the least of the beneficiaries, and, in fact, much of the help given to the Third World did not really reach the mass of the population. This, of course, was clearly understood and seen in the 60s to the extent that the Pearson Commission was set up in 1969 under the auspices of the World Bank and the chairmanship of the late Lester B. Pearson. That produced a watershed report in the literature of development strategies. †

"My suspicion is that Mr Pearson was impelled to return home and try to get something done as a result of that report. His tremendous influence in the Canadian political system at the time was brought to bear on the political directorate there and, together with people like Maurice Strong, they came up with this mechanism, the International Development Research Centre, which was designed, modestly, to plug some of the gaps that had resulted from the first development decade.

"The composition of this rather odd body was quite unprecedented in the history of developmental systems in that, although the entire thing was funded by the Canadian taxpayer, they included some 10 non-Canadians on the Board of Governors, people from

the Third World largely, as well as from those countries that have had a long tradition of relationships with the developing world."

Reports: What were the objectives of IDRC during those first few years?

Nettleford: "Broadly speaking, the way we like to put it is this: humanizing development systems to put emphasis on human resources and, above all, to build up the research capabilities of people within the developing world so that decisions are taken by their own people, in their own self-interest. And to determine their own destinies, they would be informed by a body of knowledge which is well within their grasp and whose formulation would be their responsibility. So it means that from the simplest form of action research — data gathering even — to the most sophisticated, the involvement of developing peoples would be encouraged with a view to policy decisions.

"Everybody takes this for granted now because that early IDRC resolve and orientation, although unique to IDRC and revolutionary in 1970, has now become the common stock and capital, if you like, of many development assistance agencies.

"IDRC was lucky enough to have as its first chief executive a fantastic human being, David Hopper, who brought a wealth of experience from his own involvement in the so-called Green Revolution in India. As an agricultural economist he had a tremendous knowledge of development strategies, of



The Hon. Rex M. Nettleford of Jamaica

scientific knowledge as it applies to development strategies in the Third World.

"He gathered around him a most effective professional staff, many of whom had gained a lot of experience, certainly on how *not* to do things from the very failures of the first development decade. So in that sense, the first development decade was not totally a failure because it bred a number of people who, through their insight, their own creative imagination, and their skill, could see what went wrong. Now they had an institution to put them right, supported by a Board of Governors I remember to be very enlightened, very carefully chosen. The Canadians



on the first Board were eager and willing to learn. And you had some people who had come with a reputation who again brought their own enthusiasm to the proceedings.

"From the very beginning, we set ourselves tasks and subjected ourselves to a kind of seminar or tutorial session where we literally looked at the problems as they presented themselves. We decided that, of course, we should concentrate on aiding the world's poor, and that emphasis should be placed on rural development, specifically in such areas as agriculture, food, nutrition, population and health sciences, social sciences and human resources development and, not long after, information sciences. Since then, science and technology policy has been added and developed, and energy is now being seriously considered. But the concentration on these areas we felt should guarantee the benefits of self-reliance, self-discovery, self-help among the large mass of people in the world."

Reports: A major criticism of Western institutions is that they largely ignore the poor or the bottom 40 percent of the population. Is the IDRC exempt from this criticism?

Nettleford: "By and large. But the IDRC is very sensible. It has not indulged in the trendy mode of looking for 'the poorest of the poor' because that in itself can be counterproductive. The important thing is that it recognizes the need to build up expertise in areas of intellectual knowledge and research capabilities so that developing coun-

tries in turn can be in control of the knowledge, because those who own the information own a very important means of production.

"Of course no IDRC or other outside agency can go into another political jurisdiction and dictate what is to be done. This is one of the reasons why emphasis has been placed, quite frankly, on the professional capabilities of the IDRC rather than the political. The respect that the IDRC professionals have gained has given them access to the sort of people in different parts of the developing world who will ensure that the projects benefit the large mass of people."

Reports: You were yourself on the Board of Governors of IDRC. When did you join the Board and what were your expectations of IDRC then?

Nettleford: "I was in it from the beginning — I'm a charter member and a founding member, and participated in helping to shape how the thing would develop and what our main concerns would be.

"My own interest is largely the full quest of maximizing the resources of the human being, our creative imagination, our creative intellect. I believe very strongly that, in the final analysis, it is the capacity of the human being to act, to think, to do, that will make anything work.

"What has happened, of course, is that I have learned a tremendous lot about the world, both the developed and the Third World. It has strengthened my own views of the world's inescapable

Inaugural meeting of the IDRC Board of Governors, October 26, 1970. Left to right front row: Sir J. Crawford (Australia), A. Dias (India), L. Engberg (Canada), the Hon. Lester B. Pearson (Chairman, Canada), Lady Barbara Ward Jackson (England), Ungphakorn (Thailand), C.F. Bentley (Canada). Back row: A.F.W. Plumtre (Canada), the Hon. R.M. Nettleford (Jamaica), I. Breche (Canada), H.A. Oluwasanmi (Nigeria), W.D. Hopper (President, Canada), P. Bauche (France), R. Campos (Brazil), R.W. Medjuck (Canada), J.G. Bene (Canada). Absent: L. Berlinguet (Canada), R. Dubos (U.S.A.), G. Gerin-Lajoie (Canada), M. Sankalé (Senegal), M.F. Strong (Canada).

interdependence, based on mutual respect and understanding by all people.

Reports: What were your expectations then when you sat on the IDRC Board?

Nettleford: "I expected it to do precisely what it did: develop an understanding of the capacity of the developing world to take decisions in their own interest and manifest it in practical programs; encourage that degree of self-confidence among peoples in the developing world, with no strings attached; and demonstrate to the world that those who enjoy a certain amount of wealth can relate to those who are poor on the basis of mutual respect."

Reports: How has IDRC evolved over the years?

Nettleford: "It has evolved as a high-powered professional body. It has gotten worldwide recognition and is, therefore, in many sorts of development assistance consortia.

"There are also new dimensions. For

example, the North-South dialogue. It did give some money to the Brandt Commission and, although there were reservations on the Board, generally they felt that this was the thing to do. As it turned out, a report which is being mailed all over the western world has been produced[†]. But the IDRC itself is not satisfied with that. It is very much concerned about how you implement some of those recommendations and is very much part and parcel of a kind of task force to look into this so that the report doesn't become another classic in the literature of development rather than a basis for action.

"Also of late, Canadians, quite rightly, have been taking an interest in external affairs and how the Canadian dollar is spent. This, many of us who are non-Canadians on the Board appreciate, and have encouraged in the past because there needs to be a greater knowledge among Canadians of what is possible and what contribution they can make to developing a better and more equal world. The new IDRC president, Ivan Head, is, I think, ideally suited to spearhead this new phase of the development without abandoning the old commitments, while also encouraging a sense of interdependence based on mutual respect — not on anybody dominating anybody else, but, in fact, in a surge of sharing. The Canadian public can be drawn into this."

Reports: In the IDRC's 10 years of existence, what would you say have been successes and milestones?

Nettleford: "In all fields there have been significant achievements. But more important, I think, it has effectively challenged the old philosophy, which was rooted in domination, in the patronizing of the South by the North, and it has pointed a way of how to help people help themselves — not in a kind of old-time aid society way, but in terms of getting projects off the ground.

It has had multiplier effects on many of the development assistance agencies in the world."

Reports: Would you say that perhaps the work of IDRC has had some impact on the philosophy and concept of assistance?

Nettleford: "I know that has happened because Robert McNamara, World Bank president, in fact, was very much in contact with David Hopper (who is now a vice-president in the World Bank) and he was impressed with the orientation and the approach. None of these things are mutually exclusive. But we must be very careful that 'aiding the poorest' doesn't become a fad because you then deprive the Third World of the necessary cadre of people to do the thinking, the continuing reflection, the evaluation. If you do, you will have the Third World remaining the hewers of wood and the drawers of water, while the developed world continues to be the brains for the rest of the world.

"This imbalance must go. We must all think, and we must all hew wood, and all draw water. We need thinkers and doers in the Third World.

"There are several ways of doing this. This is where the collaboration with developed-world research institutions and with Canadian research institutions is important. This new dimension is very much coming to be part of our thinking at IDRC."

Reports: Has IDRC itself been imbalanced by putting too much emphasis on knowledge and research needs, rather than on meeting practical needs?

Nettleford: "No, because that has a kind of logical priority in terms of the needs of the Third World. They were never mutually exclusive, because the kind of projects we have been emphasizing are the ones that include intellectual and action content, the one drawing on the other. It's theory out of action not the other way around. In fact, everything I am saying calls for a

particular entrepreneurial skill, the skill of being able to identify the right kind of projects and being able to encourage Third World people in their own self-perception as to where they might go."

Reports: Looking in the future, Prof. Nettleford, do you think IDRC is suited to meet the challenges of the 80s? What changes do you think IDRC should undergo during this decade?

Nettleford: "Ask me what the problems of the 80s are and I will answer, 'What were the problems of the 70s?'. The notion that you solve things every decade is a myth that human beings indulge in merely to have a cushy way of looking at existence. The problems of the 80s are the problems of the 60s, or the problems of the 50s. We have not solved them at all. The innovative urge that IDRC had in 1970 continues to be of tremendous relevance.

"Yes, there has been a shift around — it has to do with energy now, it has to concern itself with alternative sources of energy. But the old commitment to build up capabilities for decision-taking and for discovering and storing appropriate knowledge which will lead to appropriate technology is something that will have to happen in the 80s.

"Maybe then one can say that the IDRC could pay more attention to delivery systems, to helping Third World countries use what has been discovered... the wheel, once invented, can be put to many uses.

"There are, of course, other things besides getting people to understand, to get at the storehouse of knowledge in science and technology and in human organization. The IDRC should help the Third World in building its own institutions and its own mechanisms, the frameworks within which it can actually take action.

"One last thing. In the whole question of the North-South dialogue, the New International Economic Order, I think IDRC has got to have a responsibility in helping the Third World marshal its own position. The Third World has a lot of energy for rhetoric, but it doesn't have the expertise in bolstering effective advocacy. And I think that the New International Economic Order, in its effort to bring about the kind of world where there is some distributive justice and mutual respect between the different contributors to the world system, is something that IDRC could continue to make a greater contribution to and of which it could be more conscious." □

[†]*Partners in development: report of the commission on international development* (New York and London, Praeger Publishers, 1969, 399p.).

[‡]*North-South: a program for survival, Report of the Independent Commission on International Development Issues* (The MIT Press, Cambridge, Massachusetts, 1980, 304p.).



The Right Honourable Lester B. Pearson



W. David Hopper, first IDRC President

FUTURE FOCUS

*Ultimately, the
focus remains
on people*

The year 1980 is much more than the 10th anniversary of IDRC. In both international attitudes and international relations it reflects a striking departure from the past. That contrast was marked in the first sense by the report of the Brandt Commission; it was marked in the second sense by the Special Session of the United Nations General Assembly on Development.

Mankind faces disaster of global proportions, said the Brandt Commission. Because the ingredients of that disaster are problems of worldwide dimension, solutions will be effective only if they are equal in scope. In the pursuit of survival, the concepts of "we" and "they" have been replaced by "us".

At the Special Session, the developing countries — those that are home to some 72 percent of humanity — made it clear that their commitment to remedial measures jointly with the industrialized states is conditional on an equal commitment from the latter. The frustrations endured by those countries as a result of continued injustice have led to a dangerous schism even as the perils of division are overwhelmingly apparent.

Disaster, said the Brandt Commission, may proceed from several sources: from an epidemic of political instability spawned by economic deprivation; from a sequential collapse of industrial and financial institutions brought about by maldistributed wealth and resources, by the disappearance of confidence, of credit, of markets; from a deteriorating biosphere suffering from the disappearance of forests and arable soil; from nuclear holocaust prompted by a reliance on armaments rather than cooperation.

Injustice along the North-South axis of the international community is more



Ivan L. Head, IDRC President

a product of indifference than of greed, more of inertia and ignorance than of intention. Yet its results are appalling whether measured in terms of human misery or of planetary degradation.

Disaster will not be averted, nor justice achieved, without a series of actions involving sectors as basic yet distinct as food, population, and health, and sectors as complex and interrelated as terms of trade, monetary practices, and transfer of technology.

There are many reasons for economic disparity between North and South but it is clear that resource transfers, no matter how large, will not by themselves lead to any appreciable change. The structures of the international monetary, financial, and trading communities will not permit it. The lack of human competence and institutional capacity within the developing countries will continue to deny it. To overcome these defects and deficiencies, a number of prescriptions are required, a variety of

actors needed.

IDRC is one such actor, its activities one such prescription. Over a period of ten years it has attempted to discharge its mandate of supporting development-related research in a fashion that enhances the indigenous human and institutional competence of the developing countries. It has done so in ways that were, in the Centre's infancy, oft-times innovative and sometimes unprecedented. It has experienced the satisfaction both of successful results and of emulation by other organizations created in its image. It has every reason to be proud of its accomplishments.

Yet in the decade to come the Centre will undoubtedly change far beyond our present ability to anticipate. Just as in the past 10 years developmental theory has proved to be critically flawed, so will the next 10 open new avenues of research, new techniques of research management, new methods of coordination and cooperation. Forecasting and planning will become essential elements in Centre processes. The insistence of the public and the Parliament of Canada on effective expenditure of tax revenues will increasingly require IDRC to engage in evaluation and accountability exercises. The shifting priorities of the developing countries will demand of the Centre flexibility and ability to respond.

In one respect, however, there will be no change. IDRC will continue to focus its attention on people, will continue to insist that their welfare be the central goal of all Centre projects. Human beings are not only the beneficiaries of development activity, they are the only true engines of the development process. They have been the *raison d'être* of IDRC for the past 10 years. So will they be for the next 10.

TECHNOLOGY

THE OLD IS MADE NEW

PAUL ICAMINA

In the *sitio* of Olanen in the north-western Philippines, only 12 out of 176 residents speak English. Although some speak both the national language (Pilipino) and the local one, more than half speak only one tongue, the local *Ilokano* dialect.

So, how do you ask them what "technology" is?

One may well not ask. The closest Philippine word for "technology" is *teknolohiya*, a Pilipino adaptation of the original. Nevertheless, a team of researchers went 250 kilometres north from Manila to the rugged western coast of Pangasinan province, and in an almost inaccessible place called *sitio* Olanen, they asked.

Surprisingly — to the researchers — the villagers had answers. Some said *teknik* or *taktik* — words adapted in the local tongue and bearing traces of American influence and the second World War. One villager said, "If you have problems, you need tactics."

"They know what technology is, but can't verbalize it. With us, it was the other way around," remembers Patricia Pangan, an anthropologist with the

research team.

In a meeting with villagers, the researcher-visitors first asked what a community was. Then using fishing boats, hook-and-line, stoves, pots and pans, they related community life to technology. Then they asked again what the people thought of the 'monster' they had stitched together out of bits of ordinary objects.

One young fisherman at the meeting walked up to a blackboard and chalked a picture of the local oblong flippers, made of marine plywood with strips of discarded rubber and slipper straps to fasten them to the feet. He then told them a story about technology transfer.

A few years ago, a group of city university students had come to Olanen for summer fun, bringing with them rubber flippers. Friendly with the visitors, the villagers found the flippers were effective for underwater swimming and promptly made their own stiff version, weighing half a kilo per pair. While they are a far cry from the flexible rubber ones, the villagers insist they are just as good.

That was in April 1979, when the joint

United Nations University/Economic Development Foundation study moved to Bani town in Pangasinan province. A year had been spent testing the research methodology in an adjacent province, with IDRC support. Researchers sought to understand the social, economic, and technological activities in communities, and attempted to analyze the existing and potential knowledge that could be used to improve the communities' technical base — and thereby, their living conditions.

Today, the research team has covered 22 of Bani's 25 villages (Olanen is a *sitio* or unit of Dacap Sur village). The project is being carried out by a project leader, an engineer, an agriculturist, a rural sociologist, and an anthropologist. This year, the team is assisted by experts in aquaculture, agronomy, and animal husbandry from Central Luzon State University (CLSU). In identifying more specific technological problems, the team consults with other experts, like a rice water specialist, an agricultural extension worker, the water district manager, and so on.

The inventory of traditional technologies in Bani showed that most problems are in agriculture on which 80 percent of Bani's 28 000 inhabitants depend. Only a few years ago did a significant change in farming occur with the introduction of high yield rice varieties (HYVs) on lowland farms. Already, the new seeds pose problems. For example, there were no difficulties in sun-drying the traditional varieties harvested in November-December when the dry season is well underway. The early-maturing HYVs, however, are harvested in the middle of the rainy season.

Since most farmlands are rainfed, water shortage is acute. The lowland villages north and east of the town are usually flooded during the rainy season and no effort is made to retain water for irrigation. The excess drains into rivers that cannot be tapped during the dry summer because of high salinity.

In rolling and hilly farmlands, farmers have long taken advantage of the terrain, building terraces to impound water and retard its downflow. However, it proves ineffective in upland soils that are light or sandy and have little water-holding capacity.



Ka Inching's bamboo water pipes in Olanen, Philippines: an indigenous and ingenious village technology that could be harnessed for community development

Until recently, most fishermen along Pangasinan's rugged western coast were really farmers who turned to the sea when lack of water during summer temporarily suspended field work. They did not invest scarce capital on fishing equipment that would lie idle most of the time. Fishing is now the main occupation in many coastal villages, however, and local fishermen envy the modern deepsea trawlers they see nearby.

In Olanen, one of these tiny fishing villages, the villagers have devised many ways of harvesting the sea. Inshore fishermen — those who work up to about five kilometres offshore — generally use spearguns, or a local version. Twenty years ago, villagers used "spears" or straightened metal rods salvaged from auto seat springs. One oldtimer recalls: "The fish were so plentiful then, we simply dived and stabbed at the fish of our choice."

Over the years as fish became more elusive, the spear's length was reduced and barbs added at the tip. The spears were "launched" by rubber strips, like a slingshot, with the fingers acting as support. Discarded umbrella ribs also became popular sources of mini-spears. Several years ago the spear or harpoon was mounted on a wooden "gun". Now both short and long spears are mounted on the local spearguns.

To improve vision while underwater, men make spectacles carved from wood or bamboo. Eye openings are covered with salvaged pieces of glass glued on with melted rubber or tar.

Local fishermen have even married the modern with the traditional. The *kaliskis* method of line fishing, instead of using the usual bait, uses thin strips of polyethylene tied around the hook to conceal the barbs. The fisherman rhythmically tugs at the stone-weighted line, causing the polyethylene to shimmer like small shrimp or squid, or to look like the scales of small fish (*kaliskis* means fish scale).

In deeper waters fishermen use simple handlines, assisted only by powerful lamps to attract fish. Almost all Olanen families own one or two Coleman lamps used for fishing and never for lighting houses except on special occasions. Other fishermen use nets suspended and allowed to drift with sea currents into schools of fish.

When interviewed, Olanen fishermen talk of schools of fish or squid encountered at sea and their inability to catch more because of inadequate equipment. Half of them believe that better fishing techniques could improve their lot, indicating that most are aware of the shortcomings of traditional technologies and would be receptive to change.

Mountain springs are Olanen's main water source and villagers carry water more than two kilometres to their houses. Inocencio Opolento, a 63-year-old farmer-fisherman, has devised a one-kilometre split bamboo pipe system to carry spring water over steep slopes and thick brush to his house and a

neighbour's. Other houses get water from where his pipe system ends.

Longitudinally split bamboo lies face up, ends connected to each other. Water flows continuously and is diverted into containers when not tapped in the kitchen; otherwise, it is allowed to run off unused. The open bamboo means that clogging by dirt or leaves is a constant problem, and when the water flow stops, either Ka Inchiong — as Mr Opolento is called in the village — or his wife follows the pipe to see where the clog is. He insists it is sanitary, "like running stream water" and besides "nobody will urinate into the open pipes."

Says Ka Inchiong: "It's very easy to extend the pipe to other houses but these people just won't."

This reflects what both researchers

THE PROJECT

In 1978, IDRC supported a project to test a development strategy that attempted to link the scientific skills of a developing country to the knowledge and skills of rural communities, ultimately to produce new technologies for the rural poor. The Economic Development Foundation of the Philippines was one of the organizations participating in a pilot study. Scientists were placed in rural areas to find out what villagers felt were their technology needs, to weigh the technology already in use, and to project what new technology might be introduced to improve incomes and productivity. The project was as much a study of the interaction between scientists and rural people, as it was of means of stimulating technical progress by combining the old with the new.

and villagers recognize: the need for *bayanihan*, Pilipino for community work. Says Mrs. Purita Festin, EDF Project Director: "The people don't even know the resources that exist right in their villages. We should get them to participate in projects that affect all of them, get them to know their capacity to do things."

"The right mix of attitude is needed right from the start. The people should be interested. When the researchers leave, we want community projects to continue and be self-sustaining. Our aim," she says, "is to maintain the right community attitudes without losing sight of the study's principal objectives."

The first step is to organize the villagers who feel the need for community action. The Philippine study uses the community as a group, rather than

the local political leaders, to identify traditional technology and augment it with the new to solve what the villagers see as their problems.

Most villagers are easy to organize having traditional links with each other in their small neighbourhoods. Researchers find them easier to bring together for festivals and celebrations, say, to discuss loan cooperatives. Still, the researchers persist, encouraged by the villagers' willingness to start again.

The study's main emphasis is still an inventory of traditional technology coupled with the identification of resources that can hasten what the villagers perceive as their slow economic development and low standard of living.

Olanen itself is a village in transition struggling with a lifestyle where, on one hand, barter is still commonly used, and, on the other hand, a market economy is slowly encroaching.

Both researchers and villagers are working closely on how to introduce new solutions to identified technological problems while retaining what is useful of the old.

For instance, Bani's second source of livelihood is livestock raising. Repeated use of year-round marginal uncultivated land too steep to till, and overgrazing on feed of low nutritional value means lean stock. Researchers are looking for high quality, year-round forage and the efficient use of farm byproducts as feed.

Ways to supplement the income of fishermen are also being studied and a first project is planned: small scale making stoves fuelled by rice hulls to replace traditional sun-drying of seawater dependant on erratic weather.

Researchers are also working on alternatives to artificial fertilizers which villagers say are very expensive. Studies show that reducing the amount of chemical fertilizer and substituting it with organic ones — even by a third or half — will greatly help already strained pocketbooks. Aquaculturists are also introducing mudfish in rice fields as a supplemental source of income for rice farmers.

The International Rice Research Institute has sent a still untried high yielding rice variety resistant to high water. It is being tested this planting season (June-August) in several villages.

"These are not dole-out technologies. In every stage the villagers themselves are involved and, when we leave, we hope to see that what they have started continues to benefit them," says Patricia Pangan.

Ka Inchiong agrees: "I have worked these soils for generations and have been successful in filling my family's stomachs and sending my children to school. But my wife and I both have to work the mountain slopes inch by inch. We're successful because we persevere."



HAZARIO TIRADO CUENCA

WORKING FOR RURAL WELFARE

In Colombia, community organization and participation are the key to the success of CIMDER's rural health project.

“We must be healthy to work the land and solve our problems...” So says Roman Cajero, a rural leader born and raised in a village where an experimental program was established by the Rural Development Multidisciplinary Research Centre (CIMDER), based in Cali, Colombia. His words are an eloquent statement of the program's philosophy: community health and welfare are the building blocks of rural development.

The program zone is located in the northern sector of the Department of Cauca, in Colombia's south-west corner, and includes the small towns of Santander, Puerto Tejada, Corinto, and Caloto. Along the road, children return from the hills with loads of

firewood and women wash clothes in the river. Sugar cane, a major crop in this region, grows abundantly along the roadside. The local people live on small landholdings, and one of their most serious problems is the shortage of farm land.

Against this backdrop, the CIMDER program, which has received IDRC assistance since 1974, has carried out specific actions aimed at improving the well-being of the rural inhabitants by raising their health and living standards and by improving social conditions. A young health worker explains that the program tries to make health services available to everyone in the community and reduce existing health problems.

The project has made the idea of "everyone working according to their capacity and resources" come true

In one village in the experimental area, a health station provides primary health care for pregnant women and sick children. One user of this service, a mother of five who has been coming to the station for two years, testifies to the project's achievements: "they help us to take care of our children and treat our illnesses. It's a good service that we small farmers need and support," she says.

COMMUNITY PARTICIPATION

In another village, a group of health promoters is meeting in the school with the children's mothers. They are discussing the importance of community organization and participation in the health service.

These communities, like many in Latin America, are socially, economically, culturally, and politically disadvantaged. As a result, an enormous human potential is excluded from development efforts. Colombia is no exception in this sense. Traditional institutions and forms of organization were supplanted during the Spanish Conquest, throwing rural inhabitants into a state of isolation and disorganization. Consequently, they have been excluded from the decision-making process and have participated little in the process of change.

At the end of the meeting, a woman carrying her sleeping son speaks about participation in the program. "At first, in our village, we were not organized. The visits from the CIMDER people made us see the need to organize, find out what our problems are, and how to solve them. Soon afterwards, we decided to hold a meeting and, with the help of the health workers, we organized the Family Health Association. The Association enables us to participate in this health service just as if we had started it ourselves."

The program's striking feature and value is the fact that the community itself is helping to raise its standard of living. It has made the idea of "everyone working according to their capacity and resources" come true.

A CIMDER officer points out that experience has shown that the Family Health Associations work because they are part of the health service system, carry out activities that extend beyond the health field, interact with local organizations, and are permanent education centres that provide the foundation for more

complex organizations.

AUXILIARY HEALTH WORKERS

At midday in a small rural school, a group of health workers is having lunch. As a rule, they work as a team, supporting each other and even preparing their daily meals together. This cooperation helps maintain group spirit and a sense of fellowship.

A young health worker explains that the women in the group are natives of the region, volunteers chosen by the community and specially trained to provide health services to their fellow villagers. They are able to care for most of the illnesses occurring in the village without having to unnecessarily call for a doctor's assistance.

CIMDER

"Research is the mainstay of CIMDER since research findings make it possible to formulate strategies, develop programs, do follow-up and evaluation work, and provide technical assistance to the Rural Health Service System."

This statement was made by a CIMDER program official. CIMDER is a multidisciplinary program that brings together professionals from various fields. They form a team that works to apply science to human development in rural areas. Among them are doctors specialized in public health, nurses, development economists, sociologists, administrators, agricultural engineers, and educators. All of them play key roles in decision-making and defining strategies and programming.

Some of the health workers travel on foot, others ride bicycles on their home visits to families, but all carry woven bags that hold their work instruments: health history cards, a medical manual written in collaboration with communities, and tri-coloured strips used to determine the nutritional condition of children under six by simply measuring the circumference of the upper arm. They also provide care for pregnant women and children at health stations. In one of the villages, this station is simply a room partitioned in two. In the front part, on a table, is the "micro-health post" — a wooden box containing the necessary equipment for first aid and medicines. Next to the box, another smaller one known as the "master box" is filled with cards on which is recorded all the

information on the villagers' health condition (see *Reports* vol. 7 no 1).

A multi-coloured health chart called the "health flag" hangs on the front wall of the room. Its purpose is to show graphically the overall health status of the village. One health worker explains: "... red is the number of under-nourished children; orange, the number of cases of diarrhea; blue, the number of children that have been vaccinated. White means the number of families using treated water; yellow indicates the number of houses without latrines; and black shows the number of deaths."

Sometimes, several communities get together to compare their charts. Says one woman, "The charts show us what must be done and what we have accomplished. They also show us if we are in better or worse condition than other communities. It's like a race and it makes us work for the community."

A PROMISING OUTLOOK

Most of the people interviewed in the experimental area agree that the CIMDER program has helped improve the community. They are proud that illness has decreased and that their children no longer die from diarrhea and fever. As a result of the health workers' activities, pregnant women face fewer risks.

They have also learned how to treat water and build latrines. But they are especially pleased with the tricoloured strip because it lets them know for themselves if their children are well-nourished or if they need medical attention. They have made progress, not only in solving their health problems, but also in raising their level of organization which helps increase the pace of community development.

As a result of this initial experience, the program is expanding into the Departments of Choco, Bolivar, Boyaca, and Meta this year. CIMDER is also serving as the basis for the development of similar services in Ecuador, Guyana, Paraguay, and Bolivia. Other countries have also expressed interest.

The words of an elderly woman who uses the health services regularly, nicely sum up the program and its promising outlook: "... since CIMDER came to our village, my family has been healthier. Little by little, things are getting better."

Nazario Tirado Cuenca, a Bolivian journalist and expert in rural communication, visited the CIMDER project villages for Reports.

IDRC IN THE REGIONS

Latin America and the Caribbean

"It can't be true" was a standard reaction when IDRC began to be known in Latin America and the Caribbean. And yet IDRC has been on the scene now for a decade. During this period, IDRC contributed about us\$40 million to close to 250 research projects spread across almost all countries of Latin America.

How did we spend that money? Let us, in retrospect, confess our preferences. We are pragmatic and biased in favour of peasants. We have to be. Some 150 million human beings are struggling to survive at the bottom of our underdeveloped and unfair social systems. Thus, some 40 percent of that money went to foster research ventures in agriculture, food, and nutrition, destined to alleviate the plight of the poor. IDRC emphasized support to research projects seeking to improve the nutritional qualities of staple foods native to Latin America. We sponsored inquiries about forestry and agroforestry. We provided long-term and full support for experiments incorporating the ambitious concept of integrated rural development.

In health, our bias showed again. A major priority has been to help learn how to extend the basic health services to the forgotten rural dwellers. Water, sanitation, and control of viral and communicable diseases have received preferential support.

Our agrarian inclination has not prevented us from supporting efforts to find solutions for the enormous problems of urban population growth and distribution in the region.

Numerous multi-country ventures were conducted with our assistance to explore the problems of migration to cities. We also put some money into educational and communications research.

We have had two other major concerns: on the one hand, to help countries build mechanisms for formulating and applying national policies on science and technology for development; on the other hand, to aid them to establish national and international information networks that support research activities.

We feel we did our best. However, is "our best" truly the best for the nations whose scientific advancement we aim to serve? How well have we actually performed our mandate? How productive have we been?

There are no easy answers to these tough and crucial questions. But on this, our 10th anniversary, let us toast IDRC, in the firm conviction that we will meet the new challenges of its second decade with the same imagination, audacity, and vigour that have already earned for it a unique reputation.

Henrique Tono T.

Middle East and North Africa

IDRC is unique among foreign donors in the role it plays in international development. Unlike others, IDRC treats recipient countries as equal partners. This was made clear by the Centre's first president, David Hopper, in a lecture delivered in Michigan, May 1975: "The conquest of hunger will rest on the partnerships forged between nations... The dialogue between partners must be made more equal, more

accommodating of social and cultural traditions and current aspirations."

In his speech to CARE World Conference held on 4 May 1980, Ivan Head concurred with his predecessor: "We continue by accepting that new structures and new processes must be designed by architects from both North and South."

The Centre continues to respond to local needs and priorities of the Middle Eastern countries. It is left up to local research workers to identify their countries' pressing needs, define their problems, and set their priorities. In business terms, IDRC is market oriented: the projects it sponsors are tailored to meet the requirements of self-determined needs.

Research capacity within the region is unevenly distributed. Middle Eastern countries may be classified into those that have both research institutions and research skills, and those that have only universities used exclusively for teaching. In the first, more emphasis is being given to research management; in the second, IDRC helps to establish a research base.

Research management is vital to the effective and efficient utilization of the limited funds available. Dedicated to quality work as they are, researchers may not be cost-conscious. Under conditions where cuts in research funds are the norm, donors, IDRC included, are concerned about both effectiveness and efficiency.

Research management, however, is a missing link in the Middle Eastern research communities. Interdisciplinary research and a teamwork approach are new phenomena in the region. Outreach

programs, directed to the end-users of research results, do not generally exist. Local information systems have very limited data on research.

Fortunately, IDRC is conscious of these deficiencies and has already left its mark in improvements in these areas. Research communities in the Middle East, however, are anxious to see more IDRC involvement in years to come. IDRC is most welcome in our region.

A.R. Bassyouni

Asia

In its report entitled *North South: a program for survival*, the Brandt Commission calls for a fundamental shift in attitudes towards North-South relations: "The international debates on development deal not just with 'assistance' and 'aid' but with new structures... the building of a new order and a new kind of comprehensive approach to the problem of development."

When IDRC was set up by Canada a decade ago, its main mandate was precisely to bring an innovative approach to the international development scene. Instead of providing conventional technical assistance, the Centre aims at assisting developing countries to overcome the gap prevailing between them and industrialized nations in terms of scientific and technological research.

During its 10 years of operation in Asia, IDRC has always tried to project the image of an organization that truly believes in "development research for developing countries, by researchers in developing countries themselves." It has assisted researchers in the region in introducing

new dimensions into research activities. By encouraging the network approach, the Centre has succeeded in increasing the contact between developing country researchers working on similar problems. In one of the network projects supported by IDRC, researchers from Indonesia, Laos, Thailand, Sri Lanka, Hong Kong, Singapore, Malaysia, and the Philippines were provided with opportunities to regularly meet and work together, to share their experience along the lines of the TCDC (Technical Co-operation Among Developing Countries) philosophy.

Another important feature of the Centre's activities in the Asian region is its attempt to encourage researchers to work more closely with policymakers. In Thailand, for example, a cropping systems project has university researchers working alongside government officials from the Ministry of Agriculture and Cooperatives.

The IDRC has indeed established its reputation in the Asian region as a dynamic organization, and it has played a very useful role in building up the countries' research capabilities. There are indications that the Centre will continue to abide by its mandate and increase its support for "low-cost, high-impact projects", not only to contribute to the development of scientific and technological research in Asia, but also to assist in putting appropriate research findings into action.

Jingjai Hanchanlash

East Africa

For IDRC, East Africa is defined geographically to include 17 countries in eastern, central, and southern Africa. The population of this area is approximately 131 million people and is estimated to have one of the highest growth rates in the world. As much as 90 percent of the population live in rural areas and are engaged in agriculture.

It is the general goal of the countries in this region to pursue strategies that will alleviate poverty by

creating income-generating opportunities and meeting basic needs. To achieve these goals, governments have committed sizeable portions of their resources to the development of rural areas. This, however, requires sound scientific research programs oriented towards solving the problems and developing technologies that will be useful and adaptable.

Given this situation, IDRC has played a useful role in the past and has an important future responsibility to assist with the development of a scientific research capacity. In the past 10 years, it has allocated some \$9.5 million to national institutions in 12 countries of the region and has supported projects totalling \$3.2 million with international programs and institutions.

Governments in the region have placed a high priority on the development of the agricultural sector. IDRC has responded to this priority by allocating the majority of its funding to supporting research to increase agricultural production, with emphasis on the important food crops of the semi-arid tropics and their post-production aspects. A number of projects in rural afforestation have also been supported and, more recently, research has been supported to examine more efficient means of utilizing wood fuel.

As in the agriculture sector, the Health Sciences Division will need to support the training and development of personnel and continue to concentrate efforts in rural water supply and sanitation, rural health services, and infectious tropical diseases.

In the Information Sciences sector, there is a need to explore and finance research activities on more appropriate means of disseminating information from institutions to the users of technology in all fields of activity. The Social Sciences program is proposing to finance energy policy studies that could be extremely timely and valuable for govern-

ments in the region.

If the research that we are supporting is to provide maximum benefits to the rural population, however, IDRC must continue to identify critical sectors, provide research funds, and examine the technical, social, economic, and policy issues related to these problems. In addition, given the relatively new research foundation that exists, IDRC must consider more comprehensive programs that will assist the development of key scientific institutions, including personnel development at all levels, strengthening research management capabilities, developing techniques of research policy formulation, and providing linkages between institutions.

In 1980, IDRC has decided to establish an office for the region in Nairobi, which will assist in the continued development of research programs that respond to and are appropriate to the needs of the region.

R. Bruce Scott

West Africa

When the IDRC office in Dakar, Senegal, opened its doors in 1973, barely 12 years had passed since most of the countries of the region had gained independence. But independence had not been accompanied by changes in economic, scientific, and technical relationships.

The ties with the old capitals were still as strong as ever. While no written agreements stated that research remained within the dependent vertical structures that characterized the old regimes, the behaviour of many states unfortunately confirmed it as fact.

Many reasons explain this state of things, but two stand out. The first is that the link between research and development is not clearly perceived, at least not by a great number of decision-makers. Funds allocated to research are considered to be lost, with few, if any, monetary returns. To believe that improved crop varieties, now being tested for their suitability to African soils

and climate, cost millions of dollars elsewhere is something that is understood and accepted with great difficulty by anyone whose budget is severely limited.

The second reason is that fundamental research in universities has not progressed, not only because of a lack of financial resources, but because of heavy teaching loads.

The first impact the Centre had when it was established in West Africa, therefore, was its contribution to changing attitudes. Today, many decision-makers know very well that even if sophisticated research must remain the monopoly of industrialized nations for a long time to come, applied research aimed at solving the problems of day-to-day living is required for the development of African countries. There can be no real development if those directly concerned do not assume the responsibility for bringing it about. It is not a negligible contribution for IDRC to have assisted in this realization.

Yesterday's mistakes and omissions are most relevant if they lead to tomorrow's successes. In the coming decade, IDRC's second, Africa will face the same kind of problems as during the 70s. Some will be aggravated no doubt by worldwide recession, high population growth, and progressive desertification.

For IDRC, the coming decade will mark its entry in African countries having gained independence during the 70s, countries that were considered to be settlement colonies and whose independence has coincided with the repatriation of researchers and scientists. Their needs are varied and the call for help pressing. But the shortage of indigenous researchers could mean delays in IDRC's assistance. The urgency with which help is required in these countries may mean, however, that old criteria will be revised and training programs stressed. It is on this that Africa invites IDRC to reflect generously as it celebrates its 10th anniversary.

Lumpungu Kamanda



At once overpopulated and uninhabited, rich and poor, overexploited and underexploited, Togo's coastal zone, like most of the country or even Africa and the Third World in general, has been struggling with its fair share of contradictions, encumbrances hindering its development. But its burden will now be eased by new data that will be taken into account in future development planning. Without fanfare, a small, hopeful revolution has just unfolded.

With the financial help of the International Development Research Centre, a land use and planning mapping project of the coastal zone has been successfully completed. The drawing up of 13 maps — 11 of them thematic and two of synthesis — represents the most global approach possible to the region's development, offering an alternative to the usually isolated, spur-of-the-moment activities that sometimes cancelled each other out. A scientific document is now available that allows planners to consider all needs and resources before undertaking any development project. It is a promising event for this region certainly, but also for the country as a whole since the coastal zone includes Togo's capital city, Lome, and is the country's nerve centre.

Moreover it can be predicted that this initiative will set an example for the rest of the country because the caution that has marked the implementation of development projects to date, often because of a lack of information on which to base them, has served to brake the country's progress.

THE COASTAL ZONE

Although covering only 11 percent of Togo's territory, the region mapped through the project — at a cost of \$57 720 spread over 18 months in 1978 and 1979 — is nevertheless one of the most important in the country. Its population of 704 000 inhabitants represents 36.4 percent of the country's total. Population density is therefore very high at 116 inhabitants per square kilometre, compared to the national average of 35. Moreover, the population is unevenly distributed within the region. Overpopulated zones border on unpopulated expanses, resulting in a population density that can reach 200 people per square kilometre in some areas.

All of the demographic characteristics of developing countries are to be found in Togo's coastal zone: the population is young (57 percent are under the age of 20); it is rapidly growing (three percent a year); and it is subject to large migratory movements, destined largely to the capital, Lome.

With three of the country's seven cities within its borders, the coastal zone is the most highly urbanized in the country. Its economy is nevertheless predominantly agricultural. Patterns of soil utilization reveal serious imbalances. Some lands are severely overexploited and the traditional system of shifting cultivation has almost disap-

New data on the coastal zone will facilitate future planning

TOGO MAPS ITS DEVELOPMENT

CHÉRIF ELVALIDE SEYE

appeared, particularly on the plateaus where population density is the highest. A critical threshold has been reached.

The reverse is true, however, in the uncultivated alluvial plains, the depressions, and on the coastline. The soils in these areas, rich in organic matter from alluvial deposits, are not to blame. It is rather that the type of agriculture, still faithful to traditional norms, has not been modernized. The conventional crops, maize and cassava, still take precedence. All evidence points to an agricultural underutilization of an area that could play a large part in solving the problem of local and national food shortages if it was better exploited.

The great number of industrial establishments in the coastal zone, compared to the country's other regions, further illustrates its economic importance. Togo having entered the industrial age only recently, however, industrial activity provides employment for only 10 percent of the labour force. In fact, it is only after independence, in 1960, that the first factories opened their doors. Ninety percent of them are now concentrated in Lomé.

These industries are to some extent cut off from the population. Even those processing local foodstuffs have little contact with the rural population that supplies them with raw materials.

INVENTORY AND ANALYSIS

These development factors and others are inventoried in the thematic maps. According to Mr E.Y. Gu-Konu, project leader, each thematic map deals with a particular aspect of the region, detailing inadequacies as well as potential. This is particularly the case for the maps dealing with population distribution, commercial equipment and services, industries, and communications infrastructure.

The maps on land use, agricultural potential, possible cropping patterns, water resources, and soil utilization go beyond being simple inventories to suggest how agriculture could be modified. The map on the environment presents the state and interaction of various factors to enable users to predict how different areas would be affected by the programs proposed in the land use map.

A report accompanies each map, stressing certain points that the maps themselves do not cover or can only hint at, and pointing to relationships that must be taken into account in order to understand the overall state of the coastal zone.

The two synthesis maps, regrouping all of these elements, offer a global view, an analysis, and are also accompanied by specific recommendations. Guidelines for future action have thus been established. For example, it is recommended that planning and land use programs give priority to agriculture without neglecting the non-agricultural sector. Cooperative organizations are also recommended to stimulate small family enterprises more concerned with survival than commercial

production and to facilitate the peasants' modernization.

It is also suggested that the coastal zone should be subdivided into relatively uniform areas called "intervention zones", for which definite actions are recommended in keeping with the particular characteristics of each and with the need for optimal development of the region of the whole. Thus, a solution is being offered to all problems considered.

The work was far from easy to carry out. Many documents do not exist, or if they do, they are often not reliable. To draw up the map on population, for example, the researchers had to undertake another painstaking analysis of the census. And this second analysis yielded results quite different than the first. The Togolese Geographers' Association had to play a pioneering role in order to obtain the necessary assistance from often reluctant public authorities. But this situation improved steadily as the work progressed and its usefulness became evident.

No one can now doubt the usefulness of the maps and report. Full sup-

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port is now forthcoming from government authorities through the Ministry of National Education that ensured that the final document was distributed to all concerned, including State technical services, research organizations, and universities, and through the Ministry of Scientific Research from which the geographers' association has now obtained offices.

A scientific conference presided by the Minister of National Education enabled the geographers' work to be made better known. The minister clearly outlined to the participants the benefits that the country could expect from the study, carried out by national researchers in the best of scientific traditions.

And it is in this respect that the project, carried out in Togo, by Togolese geographers, is most encouraging. Staff trained by the State, acting as technicians, were able to assume the role that must be theirs to play if Togo's development is to be brought about. It is an enormous task in which all must participate. □

Chérif Elvalide Seye is a journalist with Le Soleil in Dakar, Senegal.

A STRONG BEGINNING

The Togolese Geographers' Association (TGA) responsible for the successful completion of the coastal region's land use and planning project is a young organization. Created in 1976, it counts 11 members, all Togolese geographers and researchers. Open to all geographers living in Togo, its members either work for different government technical services, or teach at the University of Benin, in Lomé.

A branch of the Togolese Association for Scientific Research, the geographers' association aims to promote the application of geography, still considered in many francophone countries of the region to be only an academic discipline. This project was the association's first, harnessing the talents of seven of its members.

According to the researchers, IDRC's help was crucial, not only financially, but also because the funding was perceived by public authorities and research organizations as a recognition of both the project's value and the researchers' capabilities. "Without this support, we would never have been able to prove our competence so rapidly," says the Association's secretary.

In fact, thanks to IDRC support and the tangible results obtained, the TGA has acquired scientific credibility. And that is without doubt the most important benefit for the Association's members. In Africa, this type of study is rarely entrusted to local scientists. Rather, the work is contracted to foreign organizations or consultants, often at a higher cost, and without necessarily obtaining better results. The consequence is an underutilization of national personnel who become less and less involved. The country, having paid for their training, benefits little in the long run.

In Togo, the favourable reactions to the TGA's project indicate that this situation is being changed. The Association has now been asked to carry out further studies, something of which it is rightly proud. It hopes this is only the beginning.

ELEPHANT GRASS

AZZA EL HUSSEINI NEW HOPE FOR EGYPTIAN FARMERS

Small farmers are reaping the benefits of a hardy forage that helps carry their animals through the Egyptian summer

In spite of the high productivity of the Egyptian land, and a cropping system that ensures a regular production to meet both export and local needs, there is a serious shortage of meat and animal products in the country. According to Dr Abdel Moneim Makky, director of the Animal Production Research Institute at the Ministry of Agriculture in Cairo, one of the major causes of this shortage is that cropping patterns do not produce enough forage for farm animals. He backs up his opinion with statistics: only about 18 percent of the total farmland is planted to clover in winter, which hardly covers the total animal feed requirements. In summer, no special forage is planted to meet animal needs: they are fed on the available by-products of plant crops, mainly wheat straw, strip-pings of corn leaves, wheat and rice bran, and cottonseed cake concen-

trates. The feed shortage in summer amounts to about 61 percent of the total feed requirements, estimated to be 3.1 million tons of starch equivalent. To compensate for this shortfall, six million tons of cottonseed cake would need to be produced instead of the present annual production of 850 000 tons.

In an attempt to solve this problem, elephant grass (*Pennisetum purpureum*), native to Uganda and other equatorial countries, was tested as a new source of forage. In 1966, Dr Makky, together with a number of his colleagues and assistants, began introducing this plant in a number of Egyptian governorates. The project was supported by IDRC in 1975.

Dr M.K. Hathout, the principal investigator for the project, says that during the past 14 years elephant grass has proved itself, producing high yields of



feed with a high nutritive value under Egyptian agricultural conditions. Field surveys have shown that the yield may reach more than 100 tonnes per hectare per season. Moreover, during its growing season from April to November, it can be cut from seven to ten times. This means an increase in total production, and a corresponding increase in the farmers' total income. And according to the researchers, elephant grass is never attacked by the cotton worm (a common pest) in spite of its dense growth during the warm season.

Having proved itself under experimental conditions, the new forage was introduced in private farms in four governorates, including the Sharkia governorate. The grass was first planted on five big farms whose owners were willing to experiment. One of them is Mr A. Beny Helal, in Menia El Kamh. After planting elephant grass, he noticed a great increase in milk production, and a weight gain in animals that he estimates to be about 25 percent. Milk production was higher in summer than in winter. He attributes this to the higher nutritional value of the new grass compared to clover, the winter forage. The dense green vegetation on his land and the animals' sustained health and production did not go unnoticed. Many smallholders in his village subsequently requested elephant grass seed for their pastures.

One of these smallholders, Mr Mohamed Koraium, started by planting 3 *kirats* (one hectare equals about 60 *kirats*) to elephant grass and has now increased the area to 13 *kirats*. He says that elephant grass solved one of his major problems: he usually had to sell all of his animals at the beginning of the summer season as he had no money to buy the feedstuffs needed to support them. After planting the summer forage, he was able to keep his animals, feed them, and sell only the milk produced.

Another villager, Mohamed Ramadan, planted his only hectare to elephant grass. He says that his average production is 100 tonnes, enough to enable him to fatten his cattle, at about 25 percent of the cost of straw and concentrates. Feeding a 300-kilogram animal with 37 kilograms of elephant grass every day, produces a weight increase of about 700 grams daily. This does not cost him more than 15 *piasters*, whereas to obtain the same increase using straw and concentrates would have cost him 70 *piasters*.

In Monofia governorate, elephant grass was first introduced in Hassan Akbawy's land. A smallholder who owns only six *kirats*, he planted three *kirats* to the new grass in 1975 to test it for himself. He has since increased the area to cover all of his land. He says that his income increased by about 25 percent, just from selling the milk from his two buffalo. Fertility increased as he no longer prevents his animals from mating at any time during the year. So convinced was he about the new forage, that he talked his neighbours into planting it on their land. There are now about

50 other smallholders in his village planting elephant grass.

In Meet-Khalan village, in Monofia, there is a woman farmer called Om-Bakr. She planted her only three *kirats* to the new forage in order to feed her animals. She can always find herself something to eat, she says, but her animals used to starve, and she had to sell them one after the other.

Elephant grass as a new summer forage is making continuous inroads in Egypt, and the distribution of germ plasm is currently progressing. This situation stimulated the investigators to conduct more studies on agronomy, soil, and forage conservation. An experimental station, Mehalet Mousa, was planted to elephant grass for these studies. The station, a 10-hectare farm, is 80 kilometres north of Cairo, and 5 kilometres from the Institute's laboratories in Sakha, where the collected samples are analyzed. Besides evaluating the productivity and nutritive value of the grass, the researchers are assessing the effects of the new fodder on the farmers' income and the nutritive status of farm animals.

Economic studies were carried out to find the ideal way to introduce elephant grass without disrupting the production of other food and cash crops used locally and exported. The first system proposed by Dr Makky and Dr Hathout was to grow the new summer forage in half the area reserved for clover in the conventional pattern of crop rotations, and to leave it on the land during the entire year. As ele-

phant grass is dormant in winter, clover production is not interrupted. The other half of the clover area is to be planted to extra wheat in winter to compensate for the loss of grain from the half now occupied by the new summer forage and to equal parts of corn and rice during the summer. This system would improve the overall grain balance and produce animal feeds equal to about 5.5 million tonnes of starch equivalent. This increase, Dr Makky points out, would more than cover the annual feed shortage.

A second system proposed is based on cultivating summer maize and sorghum crops on 75 percent of the usual area, and planting the rest to elephant grass to feed the animals. Dr Makky estimates the cash value of the animal feeds produced under this system to be 99 million Egyptian pounds (about us\$142 million). The total cash value of the additional milk and meat produced according to that system would be more than 145 million pounds (us\$207 million).

The elephant grass project is expected to lower the costs of milk and meat production, increase the national income, and introduce a great change in the traditional practices of animal rearing in Egypt. It could go a long way toward alleviating Egypt's chronic meat shortage.

Azza El Hussein is a science writer with *Ahram* newspaper, based in Cairo.

THE RESEARCHERS

As part of the summer forage project, a number of graduate students received "on-the-job" training. Azza El Hussein introduces four of them.

The first researcher was Mr Soliman Aly Soliman from the Faculty of Agriculture, Ain Shams University. While completing his master's degree on the effect of using different levels of elephant grass in fattening buffalo cows, he was able to prove that this summer forage was sufficient for fattening cattle without needing extra feeds. Experiments conducted on Friesian cows for his PhD produced almost the same results.

Three other researchers are about to present their theses on elephant grass:

● Mr Kamel Osman Ibrahim from the Faculty of Agricultural Sciences in Zakazik University researched the effect of the new summer forage on milk production and composition while using different levels of concentrates. He examined the effect on milk yield and weight gain of feeding elephant grass to buffalo, together with different concentrate

supplements. He has deduced that the new forage is both palatable and nutritive, and could cover buffalo requirements without supplementation.

● Mr Ahmed, from the Faculty of Agriculture, Al Azhar University, tested the effect of the type of ration on buffalo milk yield and composition. He concluded that buffalo fed elephant grass gave higher milk production and more fat content than those fed straw and concentrates. Moreover, he noticed that milk production did not cease on buffalo fed elephant grass, as it did in those fed other foodstuffs.

● Mr Helmy Ghanem from the Faculty of Agriculture, Zakazik University, analyzed the milk properties of dairy cattle fed different levels of different protein sources. He was able to deduce that feeding lactating cows with elephant grass alone gave approximately the same results as those fed with extra sources of foodstuffs.

Elephant grass, say these researchers, could be the only known hope for increasing total milk and meat production in Egypt, and thus increasing total national income.

THE ROAD TO A SCIENTIFIC RENAISSANCE

Seven hundred and sixty years ago, a young Scotsman left his native glens to travel south to Toledo in Spain. His name was Michael, his goal to live and work at the Arab Universities of Toledo and Cordoba.

Michael reached Toledo in 1217 AD. There he formed the ambitious project of introducing Aristotle to Latin Europe, translating from the Arabic translation of the original Greek.

Later, while visiting the medical school at Salerno, Michael the Scot met the Danish physician, Henrik Harpestraeng, who had come to Salerno to compose his treatise on bloodletting and surgery. His sources were the medical canons of the great clinicians of Islam, Al-Razi and Avicenna.

Toledo's and Salerno's schools, representing the finest synthesis of Arabic, Greek, Latin, and Hebrew scholarship, were some of the most memorable of international essays in scientific collaboration. To Toledo and Salerno came scholars not only from the rich countries of the East, but also from developing lands of the West such as Scotland and Scandinavia.

After 1350, however, the once rich developing world loses out to the North except for the occasional flash of scientific brilliance. We have come full circle, and it is we in the developing world who now turn westwards for science.

The question we must ponder is this: are the developing countries today firmly on the road to a renaissance in science? Unfortunately, the answer is no.

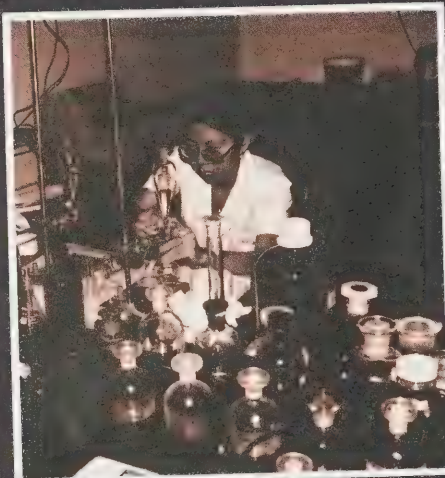
There are two prerequisites to this renaissance: one, availability of places like Toledo and Salerno for international concourse, where one can light a candle from a candle. Second, the interest in our own developing societies to give the topmost priority to, firstly, the acquisition of knowledge and, secondly, its dissemination throughout the community.

Regretfully, the opportunities for international scientific concourse are fast shrinking. It is becoming increasingly clear that the developing world will need internationally run — United Nations' agency run — postgraduate universities of science, not just for research, but also for the high-level teaching of modern technology and sciences.

The second prerequisite is a passionate, consuming desire on the part of the developing countries, the removal of all internal barriers to the acquisition and dissemination of science and technology throughout their socie-

ties, and finally, their application to development. Unfortunately, and I say this with anguish, the prognosis in this respect is not very bright.

Seventeen years ago, the Board of the International Atomic Energy Agency (IAEA) pioneered in recognizing that there are two things wrong with science in developing countries: firstly, its subcritical size, and, secondly, that it was not part of international science. One of the major reasons for the scientific brain drain then was identified as scientific isolation in developing countries. The IAEA Board can take the fullest credit, together with the Government of



Italy and with Unesco, of pioneering the first international centre in a scientific discipline.

There is no question that the developing world today needs international institutions of this type, but with requisite stability; for example, centres like the wheat and rice research institutes. Without internationalization, science cannot flourish. Such centres guarantee keeping abreast of new ideas, guarantee a transfer of science and technology by people who created it. If such centres are in developing countries, one may even envisage a reverse brain drain.

My own feeling is that almost every developing country has a technological problem that needs international scientific expertise. I strongly feel that the United Nations systems, IAEA, Unesco, and UNIDO must take a lead by directly or indirectly helping in the internationalization of science in developing countries.

In sciences, as in other spheres, this world of ours is divided between the rich and the poor. The richer half — the industrial North and the centrally man-

aged part of humanity — with an income of us\$5 trillion, spends two per cent of this (some \$100 billion) on nonmilitary science and development research. The remaining half of mankind — the poorer South — with one fifth of this income, spends no more than \$2 billion on science and technology. On the percentage norms of the richer countries, they should be spending 10 times more — some \$20 billion.

I would like to make three appeals.

My first appeal is to the developing countries. In the end, science and technology among them is their own responsibility. Speaking as one of them, let me say this, your men of science are a precious asset. Prize them, give them opportunities, responsibilities for the scientific and technological development of their own countries. At present, even the small numbers that exist are underutilized. However, the goal must remain to increase their numbers tenfold, to increase the \$2 billion internally spent on science and technology to \$20 billion.

My second appeal is to the international community — both of governments and of my fellow scientists, as well as the United Nations agencies. A world so divided between the haves and the have nots of science and technology cannot endure.

And finally, and in all humility, I wish to address myself particularly to my brothers from the OPEC Islamic countries. To some of you Allah has given a bounty — an income of the order of \$100 billion. Following international norms, your countries should be spending \$1 to \$2 billion annually on supporting science and technology. It was your forebears who were the great torchbearers of international scientific research in the 8th, 9th, 10th, and 11th centuries and who funded the first Advanced Institutes for Sciences. Be generous once again. It is as much our responsibility, in accordance with Allah's injunctions, to add to human knowledge now as it was theirs in their day. Spend the billion dollars on international science, even if others do not. Create a fund available to all Islamic, Arab, and developing countries, so that no potential, high-level, talented scientist in the developing world is wasted. □

Abdus Salam, of Pakistan, received the 1979 Nobel Prize for Physics. This article is extracted from an address to the Board of Governors of the IAEA, given in March 1980.



In the words of Zimbabwe Prime Minister Robert Mugabe, "we are still a developing country". Africa's newest independent nation does differ from most of its neighbours in its relatively well-developed economy based on agriculture, industry, and mining. However, it also shares many of the same problems — inequitable distribution of wealth and resources, a high population growth rate, disease, and unemployment.

The new government has made land redistribution and resettlement its priority in order to settle deep grievances, reactivate the peasant economy, and alleviate the burden of its 14 percent unemployment rate.

A "test case" of the feasibility of establishing a harmonious multiracial society in Africa, Zimbabwe's progress will be watched with interest. Its experiences in harnessing its resources for the development of its predominantly rural population should also benefit other countries working towards the same goal.

In the following article and interview, Clyde Sanger outlines some of Zimbabwe's present problems and plans for the future.

When the visitors and well-wishers departed from Salisbury, April 19, they left behind them a country that was formally independent and, in truth, vulnerable as anything newborn. They had cheered the spirit of reconciliation evident in Zimbabwe and praised the calm speeches of Prime Minister Robert Mugabe, guerilla leader turned statesman. They then left him to the problems of postwar reconstruction.

The problems are considerable. The seven-year guerilla war not only killed

Land resettlement and health services are major concerns of the new nation

REBUILDING ZIMBABWE

CLYDE SANGER

27 000 people, but turned large areas of the countryside into wasteland and the cities — or, rather, the African townships beside them — into crowded refuges. More than one million of Zimbabwe's seven million people became either refugees in Zambia and Mozambique, "internal refugees" in camps around the cities, or inmates of some 230 "protected villages".

Many sad statistics flow from this mass disruption. The sale of crops and livestock from tribal areas last year plunged to little more than half the value of sales in 1976. About 500 000 young people have missed two or three years of schooling. Health services in rural areas — where they often depended on missionaries — partially collapsed. Measles has been reported in Chiredzi Tribal Trust Lands. Pneumonia, malnutrition, malaria, and bilharzia are widespread.

Some observers will say that all is not gloomy. The removal of so many people from the Tribal Trust Lands (TTL) and the slaughter of about one million cattle in

these areas have meant, they say, that this overcrowded and overstocked land has had a chance to lie fallow and recover in the old pattern of shifting agriculture. And the creation of "protected villages" has led to the institution of village health workers, and the closure of rural hospitals and clinics has prompted a move towards more grass roots medicine and the "haversack clinic".

There may be a little consolation in these thoughts, but it does not diminish the size of the task to be carried out in the next two to three years, the time scale set for reconstruction.

LAND RESETTLEMENT

A first priority is land resettlement, because one of the basic grievances that fuelled the nationalist movement and led to the war was the inequitable access to land.

Under the Land Tenure Act 1969 (a successor to the Land Apportionment Act 1930) no less than 47 percent of the total land area was reserved "for all time" for white ownership. There have never been more than 6600 active white farmers, each holding an average of 2200 hectares. In contrast, more than four million Africans have been subsisting in the TTL, where the average size of plot for the 675 000 cultivators is less than four hectares. The Land Tenure Act was amended in 1977 to open up "European land" to purchase by people of any race, but very few Africans have yet been able to afford such farms. A Rhodesian Government plan for rural development, published in January 1979, admitted that the safe carrying capacity of the TTL is little more than one million people. As the population increase of 3.6 percent a

ear is one of the highest in the world, and pressures in the TTL have been rapidly worsening.

The new government has to relieve this pressure without destroying the productivity of the white farming areas, now called "open land". For, as leaders of the Commercial Farmers Union (CFU) are quick to point out, more than 80 percent of the country's marketable produce — or revenue of some z\$385 million (us\$578 million) in 1975 — comes from this "open land". About 330 000 labourers, or 38 percent of all the wage-earning Africans in Zimbabwe, depend on this agricultural employment.

And, although maize and wheat production recently dropped due to the war and a drought, the country is self-sufficient in food. Indeed, Zimbabwe can hope to earn considerable foreign exchange by feeding its neighbours. Self-reliance was the white Rhodesians' answer to economic sanctions after the Unilateral Declaration of Independence (UDI) in 1965. The move produced a healthy diversification from tobacco-growing into an expansion of food crops (wheat and soya beans, in particular), as well as more cattle. Fruit and vegetable farming were added to tea and coffee production. Nobody wants to see these pillars of the economy crumble.

Large areas of the former "European" land are presently either vacant or greatly underused. There are even empty farms in the 1.4 million hectares of what was called African Purchase Areas (now also "open land") where some 8500 black farmers obtain crop yields at least double those in the TTL, but only one-quarter those on the white farms. So there is room for many to move up the ladder of commercial farming.

The Commercial Farmers Union leaders will show you without hesitation exactly where the 2.5 million hectares of abandoned "open land" are. They fall mostly in a wide swathe from Mtoko, south past Rusape, west of the hilly, high-rainfall areas around Umtali where tea, coffee, and pine plantations make for profitable farming, and close to the most populated TTL where ZANLA guerilla activity was often most intense.

The rural development plan, published under the Smith-Muzorewa transitional government of 1978-79, suggested the resettlement of four million hectares of dryland farming, at a total cost of z\$110 million (us\$165 million). It would involve displacing 870 commercial farms and 90 000 employees and dependents. On the benefit side: depending on the targetted net farm income — whether z\$2000 or z\$800 a year (us\$3000 or us\$1200) — this area could be settled by either 10 000 or 22 000 farmers and support up to 260 000 people.

But both the commercial farmers and this 1979 plan put greater hopes on irrigated farming in the low-veld areas near the Sabi and Lundi rivers that flow into the Limpopo. Irrigated farming was pioneered about 25 years ago on the Hippo Valley and Triangle

estates with sugar and citrus plantations. At present 20 percent of the cropland on white farms is irrigated. Plans for new schemes along the Sabi and in the Rutenga area could irrigate 120 000 hectares and provide jobs for about 150 000 people.

It is unlikely these proposals will be endorsed without considerable change by the new Zimbabwe Government. After all, they envisage individual small-holdings or, in the irrigated schemes, large-scale cotton or sugar plantations. Eddison Zvobgo, Minister of Local Government and Housing, makes it clear that the ruling ZANU party looks at resettlement on more of a cooperative or collective basis (see interview, page 27). The Minister of Agriculture, Denis Norman, who was CFU President, will probably argue for a mixture of schemes.

Although there are deep grievances over land to be settled, Zimbabwe has the resources — in both land and water — to correct the imbalance and to prosper. What it needs is immediate financing for projects as large as the z\$100 million (us\$150 million) Kondo dam on the Sabi, and an intensification

The country has resourceful people who can respond to the new challenges

of training schemes for African farmers. Several have begun. The Zimbabwe Tobacco Association has launched a training scheme (56 African farmers this year, 150 next) that gives trainees a year's course on a commercial farm near Salisbury and a further year's guidance on rented land before they settle on their own.

HEALTH CARE AND INVENTIVENESS

There is also an enormous job to be done in improving health standards in rural areas. The old government left it to the missions to provide two-thirds of all rural hospital beds. In 1977, for example, only nine percent of the health budget was allocated to local authorities, missions, and voluntary organizations. By 1978, at least half the mission hospitals were forced to close because of the war, just as disease and malnutrition were increasing dramatically. In an effort to help restart some of the mission hospitals, Oxfam-UK has taken what is for them the unusual step of recruiting a dozen doctors from other countries. The missions themselves will be making extraordinary efforts to

reopen and staff the clinics.

In the new Cabinet, both the Health Minister, Herbert Ushewokunze, and the Minister of Lands and Resettlement, Sydney Sekeramayi, are medical doctors who headed field teams in Mozambique. They bring to policy-making in health matters a fresh viewpoint gained in abnormal circumstances. If you combine this with the Rhodesian experience in setting up teams of village health workers, there is safety in predicting a strong swing towards rural health services and preventive measures.

The deputy Finance Minister, Dr Oliver Munyaradzi, said as much at Independence time. He pointed out that over four times as much of the present health budget went to curative medicine as went to preventive care, and said he would like the proportions reversed.

Two particular health problems face Zimbabwe. A great number of people were maimed and crippled during the war. According to Eddison Zvobgo, ZANU left most of its badly-wounded in Mozambique until after Independence. There is a large job to be done in caring for and retraining the mutilated.

The other problem is the 3.6 percent rate of population growth. How to support such a bursting population? One man I met in the squatter camp in Harare township had two wives and eight children, living in two compartments of a plastic-sheeted hut, each about two metres square. The family's only income was the profit a 13-year-old son made on reselling cigarettes. When they return to a rural area, their means of livelihood will, one hopes, improve. But those eight children, who have at least been close to Harare Hospital, will need services near to their rural home. Multiply that one hundred thousand times. Dr Munyaradzi has his priorities right.

In this new emphasis, the inventive work of Peter Morgan should be of great use. Dr Morgan is a freshwater biologist who first came to Rhodesia to study the snails that are the vector of bilharzia. But after the experience of ensuring cleaner water supplies in the "protected villages", he started turning a lively mind to inventing inexpensive ways of pumping and purifying water. He is also the author of a ventilated privy, of which tens of thousands are now in use throughout Zimbabwe.

So the country has resourceful people who can respond to the new challenges. If this resourcefulness and the natural wealth of the land can be harnessed, Zimbabwe may relive the glories of its namesake, an ancient metropolis high in the hills near Fort Victoria where peace and prosperity reigned for five centuries. □

Clyde Sanger, an Ottawa-based writer, visited Zimbabwe at Independence time, April 1980.

ORGANIZING FOR CHANGE

... unless people know what we have been, they are not going to be able to know where we are going...

Eddison Zvobgo, Zimbabwe Minister of Local Government and Housing, and Minister in charge of district administration, talks to Clyde Sanger about the broad lines of Government and ZANU party policy for resettlement and development.

Reports: What is the basis for reconstruction and development in the countryside in the years ahead?

Zvobgo: "In most of the districts — and I am talking of all the 56 districts in the country — we have our party structure so solidly in place that we can now move forward to utilize this structure for development. Our organizational structures have, in fact, become the government. Now what we ought to do is to utilize that machinery, bring it into the purview of the law, so that the district councils — which are now simply party — can become the organization of district administration throughout the country."

Reports: Do you see quite a large movement of people going back to the land?

Zvobgo: "We see the return of refugees coming from outside, together with the domestic refugees who left the rural areas, plus a half-million people who have been incarcerated in the Protected Villages. All these people must find a place to resettle and rebuild in the rural areas."

"It would be a mistake simply to let everybody scatter around and build all over the place in some haphazard fashion. We would like to settle whole communities on the land, so that they can begin collective agriculture where they could maximize the social services that government can assist with — you know, like putting up a school, a clinic, having a reticulated water supply . . . and shops moving in, and industry setting up in these areas of population concentration, to create new growth points throughout the country."

"There are two approaches. We are democratizing the institutions in the urban areas. We will incorporate all African townships into the municipalities by statute this June, and then have

municipal elections this October. They will produce majority rule in all urban areas.

"And on the rural scene, in the so-called Tribal Trust Lands (TTL), we are



Eddison J.M. Zvobgo

dismantling the old structure where the District Commissioner was judge, jury, and administrator all rolled into one. By April 1981, we are going to have committees elected by the people, and they will be running their own day-to-day affairs, officially as organs of the State."

Reports: What are the main problems that must be tackled?

Zvobgo: "We think that many of our people are anxious to settle on the land and work. We have lots of work in the TTL simply to repair the ravages of war. We have to build new dip tanks because we lost more than 70 percent of our herd. Cattle became the greatest casualty in this war. We must rebuild our herds because we don't want to find ourselves in a beautiful and rich country like this having to import meat."

"We have tsetse fly and mosquito problems in many areas: we have to

have volunteer teams move in to do that. We have also to get hundreds of thousands of people to participate in the roadbuilding. We, as you know, mined roads in the TTL. You cannot use them, so we simply have to build new roads in order to make sure that our people can continue to travel throughout the country."

"Then the schools: we need something like 11 000 teachers just to reopen the schools. Many of these teachers had drifted into industry, others had joined other government departments. There is a crying need out there and we are going to launch a campaign to persuade all those who have been teachers in the past to come back to the profession. They are here — it is just a question of being able to bring them together. We will reopen all the schools within a year. And we must go back to the old courses that were being offered: for example, farming."

"Also, I think our university has got to become national. We intend to get the university to recognize that the current agenda calls for mass participation in development. The university should be the leader in the acquisition of skills by our people."

"Study is very important — mass literacy programs, for example. What we call the 'Each one each day teach one' program, where everybody who can read and write accepts that he or she owes something to other people, and each day if you are a party worker you have to spend an hour, two hours, teaching some other person to read and write. We believe that is a part of typical 'Mugabe day', which takes up six hours of study, six hours of work, six hours of revolutionary practice. What we call revolutionary practice is doing something for somebody for nothing."

"We want to transform this country literally into one school every night. Politics as well as some academic studies. It is important that politics is taken into every home because unless people know what we have been, they are not going to be able to know where we are going."



FILMMAKER'S NOTEBOOK

TECHNOLOGY FOR COMMUNITY DEVELOPMENT

NEILL MCKEE

Guatemala. My assignment, against the backdrop of Lake Atitlan's spectacular beauty, was to film biogas units and compost toilets. CEMAT, the Mid-American Centre for Research in Appropriate Technology, had turned down other requests to film their projects. Such visits, they found, did not usually advance their cause and consumed a lot of staff time.

There was reluctance on my side as well because of the difficulty of producing a lively film starring a static technology.

By mid-day, Armando and Fernando Caceras Estrada, other CEMAT staff, and I arrived at the Indian village of Chichoy Bajo, near San Lucas Toliman. On the otherwise deserted schoolgrounds sat two newly constructed, Chinese-type, biogas units, hooked up to the school latrines.

My worst fears were being realized.

Shortly, a man arrived and rang the community bell. From all directions, men began appearing from down the mountain slopes. A meeting was quickly organized.

We had previously discussed the possibility of filming the villagers recycling the biogas effluent and I was ready to go to work. It was not so simple, however. An hour-long discussion ensued. I had to state why I wanted to film, then each member of the gathering voiced his opinion. I was eventually officially welcomed.

A further delay—the school children had to be involved. Although they were attending the opening of a new school some two kilometres away, they arrived in about 15 minutes, some running all the way.

In no time at all I had my sequence:

Technology should serve as a focus for community organization, not an end in itself



Clockwise, from bottom left: Everyone is involved in preparing the school gardens. Armando Caceras (centre) talks with villagers about the use of biogas effluent on their vegetable gardens. Effluent is applied to Lake Atitlan — refuse washes down the steep volcanic slopes into the water which is also used for bathing. Tests on the humus from compost toilets show low pathogen and parasite levels. Biogas is piped into homes for cooking. The humus from compost toilets is also used to feed algae in fish ponds.

post toilet. One side is used by a family or group of families with the periodic addition of ashes. When it is full, it is sealed for about two months while decomposition takes place and the other side is used.

The sealing causes an anaerobic reaction and a rise in temperature that kills the pathogens and parasites. When composting is completed, the dry, nearly odorless humus is removed and used as fertilizer. In both the biogas units and compost toilets, the plant nutrients — nitrogen, phosphorus, and potassium — remain in the humus.

There was no lack of action for the camera. At every turn, CEMAT microbiologists were spooning samples into small glass jars to analyze for pathogens and parasites. To date, the results have been promising: in both biogas effluent and sludge, and in the humus from the compost toilets, pathogen and parasite levels are gratifyingly low. Preliminary tests on vegetables grown with this fertilizer have also been encouraging.

Back in San Lucas, on the parish demonstration farm, the humus from compost toilets was being mixed into fish ponds, to encourage the growth of algae, which tilapia and carp then eat. As San Lucas is 1500 metres above sea level, the temperature is often too cold for algae growth. To solve this problem, one of CEMAT's staff has devised a bamboo and plastic structure to cover the ponds — a greenhouse.

A group of people gathered around the biogas units on the farm. It was the continuation of a course for farmers from nine communities that already have biogas digesters. They were being instructed in the functioning and maintenance of the units and the growing of vegetables with biogas effluent.

Before we left, a match was struck and herbal tea served — heated, of course, with biogas, produced at 1500 metres above sea level!

men recycling the effluent from the units' outlet to the inlet to obtain more gas, and 30 children working the school gardens, using the effluent for fertilizer.

The activity was not planned. It was a demonstration of a development philosophy held sacred by the Caceras brothers and CEMAT's staff. They believe that no effective development can come about if the community does not participate at every stage of a project and in every decision. Technology should serve as a focus for community organization and development, not an end in itself.

During the hours that followed, I learned that this philosophy carries into all of CEMAT's interactions with the Indian communities around Lake Atitlan and elsewhere in Guatemala. Each of CEMAT's core of about 20 experts develops his/her own projects

in a particular area of expertise and finds funding for them.

The next day, we headed across Lake Atitlan in a small boat. The lake itself is a natural wonder, formed by old volcanoes with newer cones rising in the north. The village of San Caterina Polopo, like others in the area, is built on a steep slope rising more than 350 metres from the water. Sanitation is a great problem as pit latrines are impossible to dig in the volcanic rock. When the rains come, refuse is washed down the slopes into the lake where people wash their clothes, bathe, and sometimes obtain their drinking water. Gastroenteritis is endemic.

CEMAT knew that biogas units could not be built here because the digesters could not be sunk underground. The alternative was a Vietnamese-style, double-vault, com-

*Guyana's
successful by-catch
project and
IDRC-supported
research are
featured in new films*

TWO NEW FILMS: **SCIENCE AND TECHNOLOGY FOR DEVELOPMENT AND FISH PROCESSING**

Produced and
directed by
Neill McKee

FISH BY-CATCH

Off the coast of Guyana, a trawler casts its net. The prize: shrimp, destined for the lucrative export market.

The catch is only about 10 percent shrimp, however. The fish, up to 50 different species, are thrown back into the sea. On the Guyana continental shelf alone, some 200 000 tons of useable fish are thus discarded each year. The situation is much the same elsewhere, amounting to an estimated waste of 16 to 21 million tons of fish annually.

In 1973, the Guyanese government decided to do something about it and requested that each of the 200 trawlers operating out of Georgetown bring in at least one ton of the fish by-catch per trip. In 1978, the amount was doubled. All imports of fish and fish products were banned, creating a ready market for the catch.

To utilize this new resource, Guyana Food Processors Ltd. was charged with developing ways of processing part of the catch. *Fish by-catch... bonus from the sea* documents the operation of the a pilot processing plant, supported by IDRC.

But the pilot plant can only process about 10 percent of the fish by-catch brought into port. The remainder is sold fresh. Demand is increasing for both processed and fresh fish, and Guyana is now looking at ways of increasing the use of the by-catch.

Guyana's successful by-catch project could show the way to other coastal developing countries seeking to increase their protein supplies.

Produced and directed by Neill McKee, 16mm, colour, 12 min.

CHOICES

Tractors or ox-drawn ploughs? Food or cash crops? Preventive or curative health systems? These are some of the difficult choices that developing countries must make if they are to reach their development goals, and the theme of a new global film on the work supported by IDRC.

Choices illustrates how developing countries are harnessing science and technology in order to find solutions to their development problems. Some approaches are simple — reliable hand pumps, pit latrines, one-room schools. Others are considerably more complex — computerized information networks, induced fish breeding. What matters is that they are appropriate to the country's specific needs and conditions.

But choosing the right development tools requires understanding how populations will adapt to the changes and to what extent they will benefit from the new technology — be it large-scale industry, a village milling system, or a health education program. The film's many examples show how, in strengthening their capacity to carry out scientific research, developing countries are focusing on their greatest resource: their people.

It is the next generation who will be the real beneficiaries, but it is the researchers and decision-makers who must act on the future today.

Choices does not provide ready-made answers. It documents some of the approaches being tried, some of the choices being made, around the world.

Produced and directed by Neill McKee, 16mm, colour, 27 min.

Cassava cultural practices: proceedings of a workshop held in Salvador, Bahia, Brazil, 18-21 March 1980,

Edward Weber, Julio Cesar Toro M., and Michael Graham, editors. Published in August 1980, 152 pages, IDRC-151e.

The 17th monograph on cassava published by the IDRC, this publication presents 18 papers covering production and storage of cassava



materials, planting systems, soil-related cultural practices, disease and weed control, and techniques for large plantations.

Le rôle des arbres au Sahel: compte rendu du colloque tenu à Dakar (Sénégal) du 5 au 10 novembre 1979.

Published in July 1980, 92 pages, IDRC-158f (French only).

This publication brings together 10 technical papers dealing with the multiple contributions of trees to the Sahelian ecosystem, and their benefits to humans and animals. Five forestry projects are detailed, and a list of recommendations is included.

Bamboo research in Asia: proceedings of a

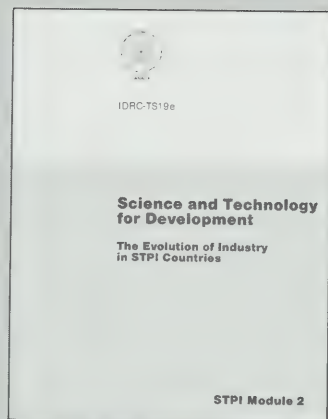
workshop held in Singapore, 28-30 May 1980, Gilles Lessard and Amy Chouinard, editors. Published in October 1980, 228 pages, IDRC-159e.

Proceedings of the first international meeting of bamboo specialists, this publication presents a summary of work in nine Asian countries. Ten articles outline particular research problems, and a priority list for future investigation is presented.

La reproduction provoquée chez les poissons: théorie et pratique. Brian J. Harvey and William S. Hoar. Published in July 1980, 48 pages, IDRC-TS21f.

This is a review of the practical application of the technique of hormonal manipulation to fish breeding. It summarizes recent advances in knowledge of the physiology and reproductive processes of cultured fish.

Science and technology for development. STPI Module 2: the evolution of industry in STPI countries, IDRC-TS19e, 69 pages. STPI Module 3: the evolution of science and technology in STPI



countries, IDRC-TS20e, 45 pages. STPI Module 4: the present situation of science and technology in developing countries, IDRC-TS22e, 67 pages. Published in September 1980.

These are the latest publications in a series of 12 modules containing the supporting material for the findings and assertions made in the Main Comparative Report of the Science and Technology Policy Instruments (STPI) Project (IDRC-109e), a large research effort that examined the design and implementation of science and technology policies in 10 developing countries.

Program directions: Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; Social Sciences. Published in October 1980, 12-16 pages each.

Basic information about each of IDRC's program divisions is presented in these four booklets. They outline the objectives, priorities, and operation of the divisions, including short descriptions of the areas of research supported. Short sections about project criteria and development are also included.



INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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Health and Development



Aid and education

I was very happy to see the excerpt from the book *Aid as obstacle* (Reports, July 1980).

Lappé, Collins, and Kinley are, for the most part, right in their diagnosis and prescription. We must not now shy away from the challenge of developing concrete, feasible proposals and plans, to quote Lappé *et al.*, "to enable the poor to achieve the power they need to direct a development process (primarily) in their interests."

In this connection, may I state a conclusion that results from studying and teaching about international development for almost two decades? I share with many others the opinion that Paulo Freire is one of the few persons who, in the past 30 or so years, has written and done something original in the field of education as it affects development. When many educational theorists mostly advocated the expansion of formal education as the means for accelerating societal development, Freire pointed to the pivotal importance of considering education as a liberating force for everyone, but especially for the poor people in the rural areas of the Third World. The best indicator of his influence, perhaps, is the fact that the word *conscientization* has become part of the modern vocabulary of many languages.

Please consider publishing a few excerpts from Freire's works in a future issue of *Reports*.

Mathew Zachariah
Faculty of Education
University of Calgary
Calgary, Canada

Cassava and salt

It was with great interest that I read of your work on

cassava (*Reports*, July 1980).

I am working on two projects in Tanzania, one dealing with cassava products, the other with salt. It is only now that I understand the relationship between iodine and cyanide. Perhaps by supplying iodized salt we will not solve the goitre problem. We will now have to look into cassava consumption patterns in planning the cassava and salt industries. It is not only agronomic and industrial factors which are critical, but also patterns of consumption.

A.K. Lal
Tanzania Industrial Studies
and Consulting
Organization
Dar es Salaam, Tanzania

Seeds monopoly?

Editors' note: Following the publication of Claude André Saint-Pierre's letter (Reports, July 1980), written in response to our April 1980 article "Seeds: patent pending", we received a copy of the following letter, addressed to the Dorval offices of Ciba-Geigy (Canada) Ltd.

We are interested to learn of your recently developed Mingo barley and, in fact, wish to establish a definite link with your establishment for the marketing of your products in this part of the developing areas, be it Indonesia or Peninsular Vietnam where abundant agricultural lands lie. Their people are poor, but they are richly endowed with natural resources.

As rightly concluded by a writer, Mr Claude André Saint-Pierre, whose letter appeared in *IDRC Reports* Vol. 9 no. 2, that the owner of a new variety must own the research funds so as to ensure a stable and sustained income for the necessarily long-term plant

breeding research, we hope we can, with this note, contribute to your R&D fund by promoting your products.

Ho Chao Chang
Managing Director
United Keng (M) SDN. BHD.
Singapore

Seeds: a response

I would like to respond to the recent letter from Mr W.T. Bradnock ("More seeds", July 1980) regarding the link between plant breeders' rights legislation in the UK and the takeover of 84 county farm supply companies by Ranks Hovis McDougall. Mr Bradnock first described this incident to me in a telephone conversation in January, 1978, in reply to my question regarding the interest of major enterprises in the seed industry as a consequence of PBR legislation. When we met in his office in June that year, Mr Bradnock obligingly repeated the episode along with an additional example of the positive impact of the legislation in which RHM was apparently stepping up its research into much-needed seed-cleaning machinery. Both the takeover account and the seed-cleaning example were given in relation to plant patenting legislation.

As Mr Bradnock has stated, during a public meeting in Regina, he did say that he knew of no connection between the legislation and RHM's activities. Based upon Mr Bradnock's original statements and additional research, I felt convinced that the connection was real and wrote of the experience in *Seeds of the earth*, being careful to report Mr Bradnock's data (which he did not refute), while avoiding any expression of his opinion.

Mr Bradnock's letter is, in several places, in contradiction with the facts as they related to RHM. In a letter dated 13 August, 1980, Mr S.V. Robinson of RHM does say that "approximately 80" firms were acquired by RHM, and that most of these firms were actually bought between 1961 and 1963 — a year before passage of the British PBR Act but also a year after the Government's report, *Plant Breeders' Rights*, was tabled by the Committee on Transactions in Seeds which approved the legislation. I believe its actions were in response to plant breeders' rights legislation.

I was — and am — reinforced in this belief by the findings of the European Communities Commission on the EiseleinRA Agreement (September 25, 1978) which particularly identified a tendency among major firms to vertically integrate through the seed industry from breeding to retail outlets as a consequence of PBR legislation. RHM is such an example.

Pat Roy Mooney
Brandon, Canada

Letters from readers are welcomed, and should be addressed to:

*Editors, IDRC Reports,
PO Box 8500, Ottawa,
Canada K1G 3H9*

Reports

THE IDRC

The IDRC Reports and companion editions *LCRDI Explore* and *El CIID Informa*, about the work of the International Development Research Centre and related activities in the field of international development, are published quarterly and are available on request from the Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9. *Editor-in-chief* Michèle Hibler. *Associate editors* English edition: Rowan Shirkie; French edition: Jean-Marc Fleury; Spanish edition: Stella de Feferbaum. *Staff photographer*: Neill McKee.

CONTENTS

Letters		2
Dangerous developments	Frank L. Lambrecht cautions that development may be dangerous to your health.	4
Aswan-on-Senegal?	The good and the bad go with the flow in developing the Senegal river. Jean-Marc Fleury explains.	6
Agenda for the 80s	Everyone has a strategy for development, as Rowan Shirkie discovers.	7
The ways ahead	According to the First Global Conference on the Future, spaceship earth is heading towards turbulent times. Bob Stanley reports.	8
Commentary Communication, society, and development	The report of a Commonwealth study calls for more attention to be focused on communications in development.	12
Desert forests	The well-being of people, land, and trees are inseparable in the Sahel, as Jean-Marc Fleury explains.	14
Factory X The state as manager	The results are mixed when government goes into business. A.T.R. Rahman looks at public enterprises.	16
Banana: fruit or vegetable?	Bananas are more than just a tasty fruit in West Africa. Jean-Marc Fleury tells us why.	19
Briefs	A quick scan of development news and trends.	20
Farmers have the last word	Video documentaries may soon shatter the myth of the backward peasant in Haiti, says Bernard Méchin.	22
New releases	A major work on sorghum and millets and new IDRC publications.	26



Cover: Women do the washing in a canal near Alexandria, Egypt — the clothes may be cleaned, but the women are exposed to parasites in the water. Development is sometimes a mixed blessing. See article page 3.

Back cover: An idyllic moment in Alexandria, Egypt. But the city looms behind the fisherman. Super-large cities are on the way in many developing countries. See articles page 7 and following.

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located at 60 Queen Street, Ottawa, Canada (P.O. Box 8500, Ottawa, Canada K1G 3H9). Regional offices are located in East Africa (P.O. Box 30677, Nairobi, Kenya); West Africa (B.P. 11007, C.D. Annexe, Dakar, Sénégal); Asia (Tanglin P.O. Box 101, Singapore 9124, Republic of Singapore); Latin America (Apartado Aéreo 53016, Bogotá D.E., Colombia); and the Middle East (7 Aflaton Street, P.O. Box 685, Heliopolis, Cairo, Egypt).

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DANGEROUS DEVELOPMENTS

*When development alters ecology,
it may create new health hazards*

FRANK L. LAMBRECHT

At the beginning of the century, the Gezireh region of the Sudan was a scarcely populated, semi-arid savanna. But in 1925, the construction of the Sennar dam on the Blue Nile made possible the cultivation of some half a million hectares. Valuable cotton crops soon turned the Gezireh into Sudan's most populated and prosperous province.

Secondary crops followed — millet, groundnuts, wheat and rice — which, unlike cotton, required constant irrigation. The canals were no longer periodically drained, and *Anopheles gambiae*, the main mosquito vector of malaria, which had been kept in check previously, found ideal breeding conditions.

In 1950, after a particularly wet rainy season, a malaria epidemic struck: hundreds died, and the number of ill was such that a third of the crops remained unharvested in the fields.

A massive and costly battle was waged against the disease, but in 1970 the World Health Organization (WHO) reported that the mosquito had become "extraordinarily tolerant" to DDT, then the only pesticide used. Four years later, the eradication campaign was abandoned.

A new campaign has now been

launched to bring the disease under control, but one of Africa's most dynamic and successful development projects has suffered a serious setback.

This is only one example of the drama unfolding throughout the tropical world. Disease patterns, stabilized as a result of centuries of adaptation between parasite, host, and vector, are now changing rapidly as large-scale agricultural development programs, water management projects, and the settlement and exploitation of new lands transform environmental conditions.

WATER HAZARDS

If only by the large areas involved, national and international water impoundment projects — dams, artificial lakes, and irrigation systems — probably cause the most important environmental changes affecting human health. They are directly associated with the increase of two major disease vectors: mosquitoes, carriers of malaria, yellow fever, filariasis, and other viral diseases; and snails, carriers of schistosomiasis (bilharzia).

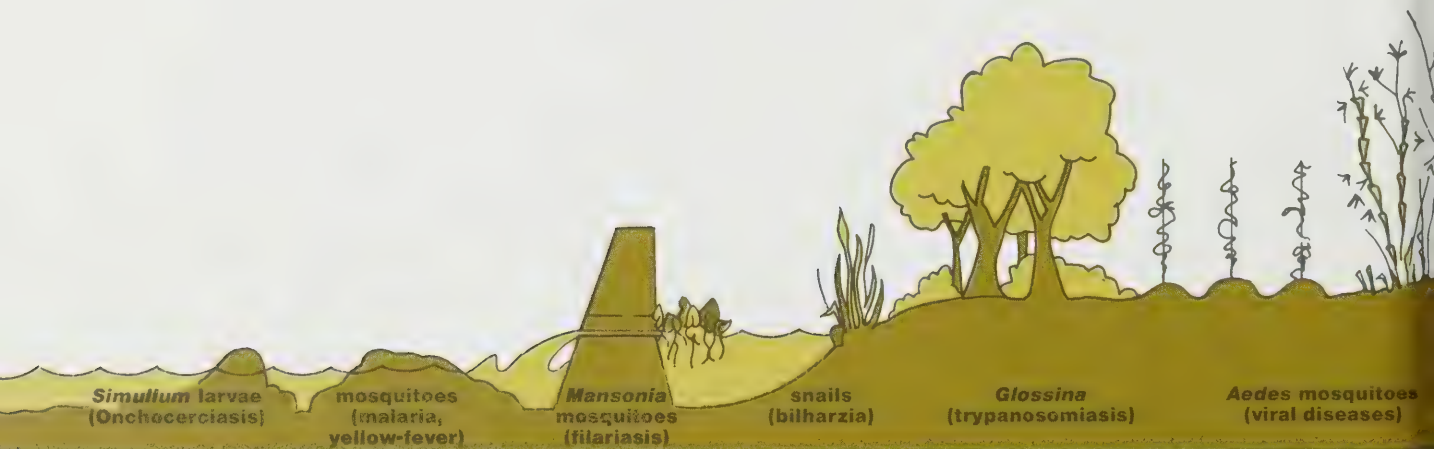
It is not so much the creation of larger bodies of water that accounts for the increase in mosquito breeding — few larvae will be found beyond 10 metres from shore — as the lengthening

of the shoreline. The damming of the Upper Volta River, for example, transformed 400 km of river into Volta Lake with a shoreline estimated at some 6400 km — eight times the previous shores, and an eight fold expansion of potential mosquito breeding grounds.

The transformation of a river into a lake not only increases the breeding opportunities, but also the choice of ecological niches, as creeks, backwaters, seepage areas, and swamps are formed. The subsequent growth of grasses, reeds, shrubs, and other vegetation further encourages the establishment of mosquitoes and the proliferation of snails.

Irrigation systems introduced in an arid environment allow water-borne vectors and pathogens to become established where they were unknown before. A well-documented example of this is seen in southern California in the USA. Over 80 percent of larval breeding sites of *Culex tarsalis*, mosquitoes responsible for outbreaks of St-Louis and Western encephalitis, occur in farming areas with large-scale irrigation.

A striking example of bilharzia gaining a foothold in a "virgin" area is reported in the Amazon basin, where the waters were generally unfavourable to snails. These conditions were re-



versed when a cement factory started discharging calciferous waste in one of the rivers, thereby changing the chemistry of the environment and providing calcium, indispensable to the snails' shell formation. Vector snails were probably introduced by migratory birds, and the parasite by foreign labourers.

Onchocerciasis (river blindness), another disease of great medical and economic importance, is also largely affected by the impoundment of water courses. The damming of a stream in which the blackfly vector, *Simulium*, breeds results either in their reduction or their increase. Whereas the transformation of a stream into an artificial lake may flood *Simulium* breeding sites behind the dam and make long stretches of river banks unsuitable, the waters downstream, and the dam spillways, may become favourable year-round breeding sites.

PEOPLE — PRINCIPAL AGENTS

People themselves are the principal agents of disease dispersal, through travel, migration, and colonization, animal rearing, and unsanitary habits. By occupying virgin land, destroying natural vegetation and replacing it with crops, roads, and settlements, they create conditions favourable to the spread of disease.

During the construction of an important dam, the primary source of alien disease agents will be the large labour force from various parts of the country or even different continents. In return, foreign workers are exposed to local parasites and to those of their fellow workers — a two-way parasite exchange. As the populations displaced by the dams are relocated, new access roads to villages and trading centres ease the spread of vectors and diseases.

The construction of the roads themselves is often instrumental to the spread of disease vectors: burrow pits, ditches, and culverts are prolific mosquito breeding sites during the rains, and can develop into favourable snail habitats.

Mosquito breeding sites are often the product of community life. In a village in east-central Nigeria, for example, mosquito breeding was found to occur mainly in clay water-storage pots. Each family compound had an average of 80 waterpots. Over a one-year period of observation, 36 percent of these contained mosquito larvae of one or more of fourteen species, including potential yellow fever carriers.

Other small-scale human activities can have country-wide consequences. A classic example is the association of malaria with pit-mining in certain areas of Sri Lanka. Here, gemstones are recovered on a hit-or-miss basis from shallow pits. Individuals work their own land. Abandoned pits fill with rain or seepage water, becoming potential breeding sites for mosquitoes, including *Anopheles culicifacies*, the main malaria vector in the island.

FOOD AND INSECTS

The final stage of agricultural development — the winning of crops — also poses particular health problems. Flooded rice fields are without doubt a major cause of health problems.

Sites for mosquito and snail breeding, rice fields cover enormous areas. As the plants grow, the increasing amount of shade provides a choice of habitats. Diversity is enhanced when the fields are not properly weeded. And, whereas in Africa, the Middle East, and parts of South America and the Caribbean, *Schistosoma mansoni* and *S. haematobium* are transmitted from person to person, *S. japonicum* found in Southeast Asia is also carried by various animals, including the water buffalo.

Ripening rice also attracts field rodents and other small mammals, some of which are carriers of leptospirosis.

Other, more insidious, crop-related health problems also occur. For instance, mosquito larvae are commonly found in axil-leaf plants as rain or dew-water collects in the cavity formed at

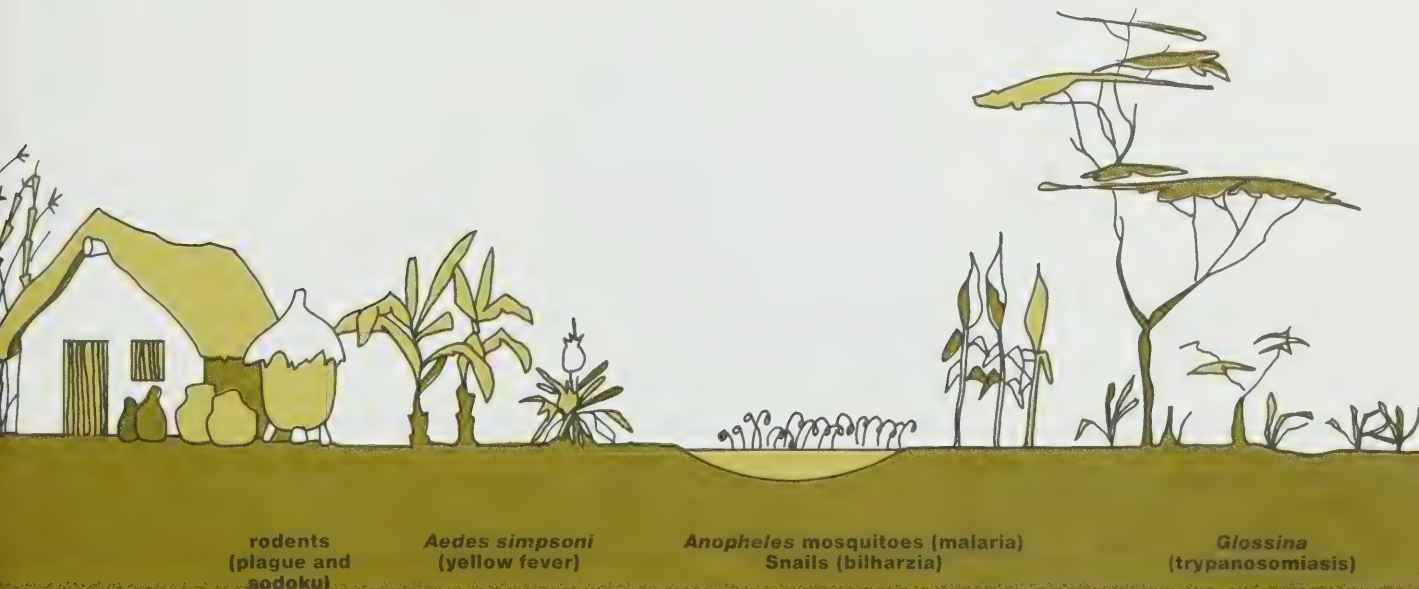
the junction of the U-shaped leaf and the stem. This type of larvae habitat is found in banana trees, cocoyam (cocolasia, taro), pineapple, and *Dracaena*, sometimes used for hedge-plants. A one-year study in Nigeria showed 12 mosquito species, including three potential yellow fever vectors, in these four plants.

Some 700 species of bamboo grow throughout the tropical world. Common to all is the hollow stem composed of partitioned sections. When the stem is cut, a hollow cup is formed. Filled with rainwater, it provides an ideal larval habitat, especially favoured by *Aedes* mosquitoes, yellow fever vectors. Used as guidepoles in the cultivation of yams — the staple food crop in West Africa — bamboo stems offer mosquito breeding sites over large areas of cultivated land.

Grain crops attract and promote the multiplication of rodents, potential carriers of leptospirosis, plague, typhus, and various viral diseases. Rat bites may bring infections with *Spirillum minus* ("sodoku" or rat bite fever). Traditional grain storage poses an additional threat by bringing rodents close to living quarters.

Coconut groves can also become important mosquito breeding sites. In Sri Lanka, four mosquito species, commonly found in spent nuts, are the vectors of Bancroftian filariasis (elephantiasis), Japanese B encephalitis, and dengue fever.

Afforestation projects must also be planned with potential health risks in mind. Generally, large-scale afforestation in arid areas will change climate and environment, and could encourage the invasion by certain insects and mammals, and their parasites. In Africa, afforestation with certain trees such as *Acacia* may attract animals and become suitable habitats for blackflies, with the risk of introducing human and animal trypanosomiasis. Recent studies in the Lambwe Valley of Western Kenya showed the invasion by *Glossina*



Gallidipes species of a pine-tree plantation, thereby extending the fly belt — previously confined to the valley — high up previously fly-free slopes. Also in Western Kenya, *Glossina fusipes*, normally a riverine species, spread from the shores of Lake Victoria into the hedges traditionally used to delineate living compounds. A plant introduced from South America as an ornamental shrub, *Lantana camara*, was primarily responsible. Of rapid and dense growth,

it invaded large areas and enabled the fly to occupy habitats near human settlements, resulting in the severe sleeping sickness outbreak of 1963-66.

Even in carefully planned and well executed development schemes unexpected health problems may crop up. However, knowing what could happen, it will be easier to implement counter-measures. In all cases, prevention through medical surveillance and primary health care can avoid

many health problems. It is, therefore, of the greatest importance that health planning becomes an integral part of any development scheme. Agricultural and livestock development do not make sense when, in the process, malnutrition is replaced by disease. □

Dr Frank L. Lambrecht was Principal Research Scientist at the International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya. He is presently at the College of Medicine, University of Arizona, USA.

ASWAN-ON-SENEGAL?

JEAN-MARC FLEURY

Arabs from the north and blacks from the south have met along the length of the Senegal river for centuries. Soon, the venerable river will become the focus of a large-scale cooperative project between African nations.

Satisfied just to be so favourably placed on the major trans-Saharan trade routes, people in communities along the Senegal river have never made much of an attempt to exploit the productive resources of the valley. Today, it is the home of two million people and includes some of the poorest regions of Mali, Mauritania, and Senegal. Most men leave the valley to find work, and it is the millions of francs CFA they send back that ensures its economic survival. The shift of commercial activity toward the coast was the beginning of the valley's decline; drought then made it a disaster area, underscoring the fragile climatic balance of a region that borders on the world's largest desert. In an effort to stanch the hemorrhage of human and economic resources, the three governments resolved to master the river's water resources and, in so doing, protect their people from the uncertainties of climate.

On December 12, 1979, the heads of state of Mali, Mauritania, and Senegal inaugurated work on a huge US\$550 million hydro-agricultural complex. The project will build a salt water control dam in the river delta at Diama to prevent the inland flow of salt water. The project's hydroelectric dam at Manantali (Mali) will regulate the rate of flow and provide irrigation for 400 000 hectares.

During a good year now, the Tukulor, Moors, Wolof, Sarakolle, and Bambara peasants gather two harvests — one rainfed and the other from flood plains nourished by the Senegal's overflow. However, the large control structures involved in this project will prevent flooding, and flood plain crops will be replaced by irrigated crops on pump-watered land. The Organization for the Development of the Senegal River (OMVS), a multinational pro-

ject management organization set up by the three countries, has promised to resettle farmers on irrigated lots when flood plain agriculture becomes impossible.

The enterprise is not without problems. Extensive programs to initiate farmers into the complexities of irrigated farming have been under way for several years, but have met with only limited success. Opinions also differ on the cost-effectiveness of the project: costs work out to between 1000 and 2000 francs CFA (between US\$6000 and \$12 000) per hectare of developed land. Ecological studies predict adverse effects on fish stock, and there are fears that as irrigation canals proliferate, so will the snail vectors of bilharzia.

In spite of this, many experts believe the project is worth the risks. They argue that costs per hectare are comparable to those incurred in many other West African projects. In Upper Volta, irrigated land behind small dams costs one million francs CFA per hectare, not including the cost of the dams themselves. Other projects involving complete control over water resources require even greater capital investments: 1.4 million francs CFA per hectare for the Banfora sugar works in Upper Volta; 2.5 million in Mauritania,

and 3 to 4 million for installations in Niger valley.

Valley conditions are optimal, according to Herman van Brandt, head of a special irrigated rice project being conducted at the Richard-Toll agricultural research station on the banks of the Senegal by the West African Rice Development Association (WARDA). "Sunlight conditions are ideal throughout the year — the sun is rarely clouded over as it is in humid tropical regions. Then, there are few insects. And because it is less humid, there are fewer fungal or viral diseases."

For van Brandt, the capacity of the Senegal valley for growing rice in particular, but also sorghum, fodder crops, vegetables, and even wheat (in the "cold" season), is comparable to that of the Sudan. Van Brandt admits that these exceptional conditions could change once there are several hundred thousand hectares of rice fields actually being cultivated throughout the year. Consequently, the purpose of WARDA research in the Senegal valley, financed in part by IDRC, is not only to discover the varieties best suited to fields slated for irrigation, but also to head off problems that might arise under the new conditions. Tahin Diop, a WARDA entomologist, is already working at identifying parasite-resistant varieties. He is also evaluating various pest control techniques in cooperation with approximately 60 farmers located throughout the valley's six ecological zones.

Large-scale irrigation projects almost inevitably produce certain undesirable side effects (see preceding article). There is no reason to believe the Senegal river project will be any different. However, the regional governments are not about to sit back and watch an essential source of well-being for one-quarter of the Malian, Mauritanian, and Senegalese populations simply dry up. They are giving themselves six years to build the Diama and Manantali dams — six years to bring the valley back to life and banish the spectre of drought.



AGENDA FOR THE 80s

ROWAN SHIRKIE

People want to be players. It is no longer enough to sit by and watch the great actors — the United Nations, governments, corporations — draw out what appears to be a global tragedy of mass poverty, hunger, war, greed, and economic collapse set in the developing countries.

So it was that when 1200 people met in New York in September, at a conference, "Agenda for the 80s: people's strategies for development", they came not to hear about problems, but to learn how they could participate in solutions.

The eleventh special session of the United Nations began the same week. It was the occasion that gave representatives of nongovernmental organizations in Canada and the United States a chance to plot out their own versions of Rene Dubos' dictum: "One must think about global problems. But the only way you act is locally."

The participants were a fairly diverse lot: school teachers, retired business people, housewives, community workers, and churchmembers brought together by a common concern in development. They also shared a sense of frustration with the "poverty of ideas" of the world's governments and organizations like the United Nations, and the apparent inability to do anything to avert the global crisis such institutions so loudly proclaim.

The Agenda organizers were prepared to help people address the issues in 13 simultaneous workgroups run over the three days of the conference covering aspects of food, energy, trade, disarmament, communications, labour, science and technology, multinational corporations, children, finance, population, culture, and women. Although there were no hard-and-fast answers produced in the workgroups, people began to shape a set of general principles on which they could act.

Do not accept that hunger or poverty or any of the other inequities in the world are inevitable or normal. Questioning the status quo is the necessary beginning of change, the participants learned. We may not be able to act directly in developing countries, but we can take positive action locally to reform our own institutions and promote the sort

of social progress that will support people in developing countries.

In the science and technology workgroup, as in most others, people were the scale against which development was judged. As Rensselaer Polytechnic Institute professor and author Romesh Diawan, one of the panellists, put it: "The goal of technology should be to



enable people to define their needs and use the appropriate tools to meet those needs themselves. The way of evaluating a technology should be its usefulness — the best are those that can be appropriated most widely and by the greatest number of people." Otherwise, he said, as we aim for technologies that replace the need for work, we also supplant the human ability to do work. The people in a technological society become disabled, in effect.

There were other, more specific, warnings issued to the workgroup, and strategies were suggested to help prevent people in developing countries from becoming "victims of technology." Participants were told that the North was taking advantage of the South's eagerness to industrialize by exporting hazardous and polluting industries. Asbestos textile manufacturers were cited as an example of an industry avoiding the tough pollution and safety standards set in North America by establishing plants in Mexico and India. A suggested local action with global consequences was to monitor industries at home. People could

ask directly of industries located in their communities if the same responsible standards for worker and community safety were applied in any overseas operations.

Personal involvement in development nevertheless came in for some biting criticism from Joseph E. Coates, who described one form — volunteer programs such as CUSO and the Peace Corps (now part of ACTION) — "as a way for middle-class North Americans to give their children a religious experience" in a sort of development evangelism. Coates, a private consultant and formerly with the US Office of Technology Assessment, also turned the tables by saying technology was the victim of human ignorance, and that there were "limits to egalitarianism" when it came to making decisions on science and its applications to development. He goaded people to give up "wishful thinking" about tinkering with existing institutions in the hopes that they might be made to work better, but insisted that individual action would be no improvement if it did not flow from critical and reasoned thought and an understanding of science.

And in fact, in the wrap-up session that brought the separate workgroups together, the participants themselves called repeatedly on one another to give individual thought to development issues. A special plea was made for awareness of the threat posed by nuclear weapons, and constant reminders were issued that war could make all development efforts futile.

People were asked to draw on their daily lives for one development-supporting action that they could undertake "tomorrow". A teacher said she would include a period of development education for her primary school class; someone else would write a letter to the local paper; another decided to set aside one hour a week for reading on issues; another pledged to eat more meatless meals.

And so, almost before anyone realized it was happening, the agenda for the 80s was set. People are beginning to become aware of the potential for change that lies in individual action for development. They have begun to think globally, act locally.

THE WAYS AHEAD

Spaceship earth is headed towards turbulent times, according to the first global conference on the future.

BOB STANLEY

There was a joke going the rounds of the halls at the first Global Conference on the Future in Toronto last July: It's already been decided — the future starts tomorrow!

Never was a truer word spoken in jest.

For what the experts presented at the conference's 400 workshops were not, for the most part, science fiction predictions, but scientific projections. You take a trend, and you project it 20, 30, 50 years into the future. What you end up with depends largely on your original point of view, the trends you select (and those you choose to ignore), and which way you project them.

All of which might explain why there were almost as many opinions about what the world is coming to as there were experts — and why many of them seemed to contradict each other. The value of such exercises, say the futurists, lies in the fact that the future really does start tomorrow — every day — and it can be influenced for better or for worse, if we know where any particular path may lead us.

Five thousand delegates attended

the conference, according to the organizers. Many of those attending were also participants in the bewildering array of panels with topics ranging from space colonization to windmills. They ranged from the notable to the notorious, from oracular consultants to future fools. And, if nothing else, they proved by their sheer numbers (and at us.\$50 each per day) that futurism is the newest growth industry.

In fact, studying the future, with a view to avoiding some of the more grisly probabilities, has become a perfectly respectable occupation for governments and international organizations of late. The past year witnessed several such undertakings, the most notable of which was the publication in January of the report of the eminent Brandt Commission, established under the auspices of the World Bank.

Entitled *North-South: a program for survival*, the report contains eloquent warnings of the dire consequences of continued failure on the part of the industrialized nations to meet the real needs of the Third World countries (see "Survival on the Brandt plan", *IDRC*



July saw publication in the USA of *Entering the 21st century — the global 2000 report to the president*. It, too, concludes that "the problems of preserving the carrying capacity of the earth and sustaining the possibility of a decent life for the human beings that inhabit it are enormous and close upon us." It calls for "prompt and vigorous changes in public policy around the world", and warns that the time for action is running out.

COMMON INTERESTS

Also in July, the Parliamentary Task Force on North-South Relations, which was set up only in May, issued its interim report in Ottawa, stating: "The Task Force has no more important job before it than to demonstrate in concrete and practical ways that our interests as a people are bound up in the 1980s with the well-being of the developing countries."

Elsewhere the interim report is more specific: "Closing the rich-poor gap is no longer just a matter of striving for social justice, although that goal is still paramount. It is also important to the continued economic development of the industrialized countries. North and South have more interests in common than is generally recognized: energy, commodities and trade, food and agriculture, monetary solutions and inflation control, technological innovations, ground and space communications."

That same theme of the commonality of interests, the realization that we are all passengers on the same "spaceship earth", was also very much in evidence at the Toronto conference on the future.

Thinking globally, acting locally, was the official theme of the four-day gathering, and the organizers did their best to ensure that it was truly a global event. While the majority of the delegates, speakers, and panelists were from North America, the Third World was well represented, thanks in part to some travel grants provided by the Canadian International Development Agency (CIDA).

CHANCES OF SURVIVAL

For those involved in the field of international development, and there were many of them at the conference, it was an opportunity to take a look at some familiar problems (and some unfamiliar ones) from a fresh angle. And if that viewpoint was not always encouraging, nor was it entirely bleak. In fact the conference seemed to be divided into two camps: the optimists, who believe that the bright new world is just around the corner, temporally speaking, and the pessimists, who fear a grim future in which humanity's chances of survival are perilously slim.

Both camps seemed to agree, however, that humanity is in a period of transition. If we survive that period things will be better, maybe much better. But the next 30 to 50 years are going to be very tough.

There was also consensus on the

urgent need for action: that despite the repeated threat of famine, despite the population explosion, despite the impact of the energy crisis, governments and institutions are simply not taking the right kind of action fast enough. There was little agreement, however, on just what kind of actions are needed.

If the smörgasbord of topics and the profusion of opinions was sometimes bewildering, that was perhaps as it should be. As conference co-chairman Maurice Strong, former head of the UN Environment Programme and Chairman of IDRC's Board of Governors in 1979, suggested, the situation represented "a reflection of the diversity and complexity of the real world in which we must make our choices."

FEAST OR FAMINE?

Food was one of the major topics at the conference, occupying dozens of separate sessions. Participants heard suggestions that ranged from concentration on making the world's millions of small farmers more efficient, to plans for building totally self-supporting "agrocities" in the desert. Experts discussed

the probabilities of weather control and the dangers of the "greenhouse effect" that could lead to "widespread fundamental changes" in earth's climate. Others talked of "climate defensive strategies", using such simple measures as improved food storage, cultivation of appropriate crops (such as millet instead of wheat in semi-arid areas), and the use of nonproductive land to raise cattle.

While one expert predicted mass starvation by the year 2000 unless there is more highly intensive agriculture, another claimed that the American agricultural system is so energy-intensive that it would use up all the world's fossil fuel resources in just 10 years if applied on a worldwide scale. And another expert claimed the problem is not lack of food, but lack of infrastructure. Protein-rich algae could feed all the world's people for just pennies a day per head if properly developed, said another, pointing out that algae had been a staple part of the diet of the Incas thousands of years ago. There was, he added, no excuse for starvation.

POPULATION STILL BOOMING

The UN estimates that the annual average rate of growth of world population will decline to about 1.8 percent in the early 1980s, and about 1.6 percent at the end of this century. Even with this decline, however, about two billion people will be added to the global population in the remaining two decades. Most of this increase would take place in the areas that have already experienced the largest increases in population between 1950 and 1980, and these constitute the poorest regions of the world.

The existence of poverty and problems of development are not new, but what population growth has done in the past three decades, and will continue to do, is to make these problems more intractable by changing their scale. For example, it is estimated that while world grain output doubled between 1950 and 1978, per capita output increased by only one-third.

There is no reason to believe that the world population problem has been solved, even though fertility rates have begun to decline. In the next two decades, changes in population structures are likely to produce different emphases within the core of population programs. Migration of population from rural to urban areas has intensified and the less-developed countries are now experiencing an unprecedented growth in urbanization. About three-fourths of the population of less-developed countries will be living in

urban areas by the end of the century. It is projected that by 2000, there will be nearly 60 cities of more than 5 million people.

Population dynamics has produced contrasting structures of population in the developing and developed countries. While it has moved overwhelmingly in favour of a younger population in developing countries, the decline in fertility to near-replacement levels and the lengthening of life span to over 70 years are resulting in an increasing population of older persons in the developed countries.

Rapid population and economic growth stimulate the demand for scarce productive inputs and lead to an intensified exploitation of resources, resulting in environmental damage and diminished productivity. It is important for us to realize that the global environment has changed and the survival of many interrelated institutions and policies under the new circumstances depend on our capacity for innovation.

We are passing through turbulent times, and population dynamics is a major cause of this instability. In the face of shrinking international resources and growing political and economic tensions, it is necessary to exercise the utmost care in establishing global priorities. In this respect, population certainly deserves the highest consideration.

Rafael M. Salas
Executive Director,
UN Fund for Population Activities

Technology sessions offered as many alternative futures. There were the advocates of the high-skill, capital-intensive approach, who argued that there is too little time left for the Third World countries to go through the pain of an industrial revolution. Solutions have to be found now. There were the appropriate technology supporters, who argued that high technology is already out of control. And there were the representatives of multinational corporations, who claimed unabashedly that the future would be a lot brighter if it were left to them (see *Marshalling a solution*, p.11).

In between were those who warned that the high-low technology argument is self-defeating, and that we must make use of the best of all types of technology to survive. The photovoltaic cell and the microchip may be just as "appropriate" as the windmill. And

one panelist warned that the real problem is not the technology, but who controls it, who has the right to choose, and, above all, who knows what to choose.

SEA OF PLENTY?

Energy and the environment were also major topics. There were discussions on the feasibility of bringing power to the cities of the future by sunlight beamed down to earth from solar collector satellites. And at the other end of the scale, a demand for reliable, inexpensive solar technology to meet the basic energy needs of the villages of the Third World. There were proposals for an international crash program to develop nonpetroleum resources, and demands for global management of all energy supplies.

The destruction of tropical forests by people searching for firewood (which provides 90 percent of some countries' fuel needs) was threatening to

destroy thousands of species and turn many regions into deserts, warned another panelist. Others warned that uncontrolled exploitation of minerals and oil from the ocean floor could destroy all life in the seas, and in the process cut off one of the world's major sources of food. But properly managed, the seas could provide solutions to all our food and energy problems, according to another expert, who predicted that the first cities will be built on the seabed before the end of the century.

FUTURE CHOICE

So the debates continued, dozens of them simultaneously for up to 16 hours each day. And at the end, a distinguished panel of "futurists" attempted to sum it all up. Their conclusions can be condensed into two words: innovation and involvement. Speaker after speaker called for new approaches, new institutions, new ways to get the world off a track that seems to be heading for

BIG ISN'T SO BAD

The development of many super-large cities in poor countries is not only possible, but likely.

The root causes of this growth are deeply embedded in current economic and demographic trends. Natural growth is still rapid, albeit reduced from the even higher levels of the recent past, and even if no new migrants were to arrive, large cities would continue to grow over the next 20 years due to the "inertia" of current natural reproduction. Perhaps more significantly, rural population growth continues to be siphoned off into urban areas. And, private investment continues to favour larger cities. Access to skilled labour, markets, and transport is better in large cities.

Large may not be beautiful, but it is cost-effective for both private and public investment. In countries with limited resources, the efficiency criteria will be of paramount importance. Poor nations may not be able to afford a decentralized approach to urban development.

Policies to change or limit metropolitan concentration will be implemented with greater effort throughout the world, but these efforts will only be partially successful. One option is to stop population growth, but even when family planning and other policies to reduce growth are vigorously applied, they do not always bring about the desired re-



sult quickly. Significant reductions in rural and urban fertility taking place now and in the coming decade will have greater impact after the year 2000, not before.

Option 2 is to keep farmers on the land. Various reviews of these efforts lead to rather cynical conclusions, about the way in which the more powerful and efficient use such programs to their own benefit.

Option 3, to colonize unsettled frontier regions, is available in only a few countries. Option 4 is to develop small urban towns and intermediate cities as "growth poles" for rural-urban migrants. This is a more viable option, but successes to date tend to be limited to countries with centrally-controlled economies and higher levels of development.

There is, therefore, a great deal of room for creative thinking and social as well as technological invention in devising ways to provide better services along with income-generating activities that will allow people to pay for these services. The efficiency of size has shown no tendency to decline even in the largest cities.

A temporal analysis of the ability of large cities to provide employment and income to their inhabitants shows them to have fared much better than many planners foresaw a few years ago. Overall, the migrants who came obtained better incomes than they had done in the places they left.

Super-large cities are on the way in many developing countries whether we like it or not. Life in the LDC supercities of tomorrow may not be something to look forward to, but it may be better in many respects than life in the small villages of those countries today.

Alan Simmons
Social Sciences Division,
IDRC

certain disaster.

Mahbub ul Haq of the World Bank warned that the critical issue is not the danger of a nuclear war, but the economic distance between the very rich and the very poor. Developing countries must control their population growth, he said, and developed countries must control their consumption of resources. And above all, expenditure on defence must end. Roy Amara, of the Institute of the Future, echoed the feeling that people no longer trust governments or institutions. People were no longer content with representative democracy, he said, and there was a need for innovative institutions that would permit real involvement.

Alexander King, of the International Institute of Advanced Studies, gave the optimistic view when he told the delegates he saw the world entering a transition period of about 40 years. During this period population would stabilize, energy sources would be re-

newed, and there would be a new technological revolution.

It is highly unlikely that more than a small percentage of the futurists' predictions will be realized, and no doubt there will be some red faces at the second global conference on the future in 1985. But such international "think tanks", and reports like that of the Brandt Commission, do help provide some pointers, however vague, to the way ahead.

In the words of chairman Maurice Strong: "The future will be what we make it. Most of the basic forces that are shaping our future are the result of human actions and human failures. We are today in command of our own evolution." □

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MARSHALLING A SOLUTION

The world is clearly in crisis. First, in the industrial world, economic growth lags. There is consumer saturation. A high degree of trade union power and of business concentration erects structural barriers in the struggle to overcome stagflation, while 15 million unemployed, us.\$200 billion in savings, and unused industrial capacity await creative use. Serious labour shortages threaten the North in some sectors. At the same time, the cost of raw materials will certainly move up.

The South, too, is in crisis. Population continues to boom. Massive migration of people to the metropolitan areas creates hectares of explosive slums. Unemployment and underemployment are at staggering levels. The South will continue to have heavy concentrations of population in ages 20 and under, creating job pressures with dangerous social and political implications.

Increasingly, the OPEC countries find themselves in an untenable position. Caught up in competition among themselves, and unable to work out a rational pricing system, they continue to escalate prices at a pace that threatens the entire world economy.

We have a triple crisis, therefore. However, it is a crisis that spells opportunity, for when the parts are put together, it is clear that the problems faced by each are — or at least can be made to be — complementary.

This is not a hypothesis. A historic example of the kind of solution that is possible is that of the situation faced by the Western world immediately following World War II, and

the Marshall Plan devised to deal with it. It will be much more complicated and require great patience and political skill to put together a global Marshall Plan. Nonetheless, I believe the world is ready to do just that. The mutuality of interest is becoming dramatically clear, and the fact that there is no alternative to matching needs, resources, and strength in an overall global initiative is so stark that it is impossible to ignore.

Fortunately, we have an institution in place that can play a prominent part in carrying out this new global initiative. I refer to the international company that has, in actual fact, been the primary instrument in the internationalization of production. Most of the technology that is desperately needed in the developing world if the global Marshall Plan is to work has been developed by these companies and is owned and controlled by them. They also have along with it a special capacity to deliver that technology, as well as management capacity and marketing know-how. The distinctive aspect of the role international companies can play most effectively is the impact of moving those resources as a package of productive factors tailored to the needs of a given project.

I not only think it can be done, I think it will be done. The triple crisis the world faces in 1980 will spell opportunity and progress in this decade and a much brighter day when we enter the 1990s.

*Orville L. Freeman
President,
Business International Corporation*

RATHER FIGHT THAN EAT?

What are we going to do to improve the world's food supply? The present hodgepodge of food aid organizations lacks coordination. They may have the mandate and the wherewithal to do something, but nobody with clout has managed to coordinate their work and check their effectiveness. Instead, they use their resources and capabilities to play political games and fight one another.

I don't mind saying flat out that I am not satisfied with the current state of affairs.

But I don't want to give the impression that the world food problem will go away if we simply throw money at it. I firmly believe that the developing countries must produce much more of their own food, and that the key is to first develop a strategy for increased food production. Maybe when we get this kind of global food strategy firmly and clearly in our minds, we will see governments putting more of their capabilities and money into agriculture, rather than armaments. Sometimes, it makes me wonder if people would rather fight than eat.

Given the collective will, we have the resources and the technology to feed everyone. The OECD's economists expect that even with a world population of 12 billion — three times the present amount — we will have the resources on this planet to feed everyone. It is going to be more expensive than it has been in the past. More land will have to be cleared. They'll need more irrigation. And new technologies are going to have to be found to allow people to farm in those areas without destroying the environment. We will probably see less cropland devoted to feeding livestock and more to cereals for humans. And we'll probably see the use of new biological processes to create foods such as single-cell protein.

But the president of the World Food Council sees signs of improvement ahead. He points to a renewed political determination on the part of world leaders for a stepped-up collective assault on hunger.

I can't stress too strongly that the will to which I am referring starts with individuals. When individuals start to do something about the world food problem, that's when things start to happen.

*The Honourable
Eugene F. Whelan
Minister of Agriculture,
Canada*

In August 1979, Commonwealth heads of governments endorsed the establishment of a committee to study communication and media problems with particular reference to the needs of developing countries, as a basis for identifying communication priorities and suitable forms of cooperation. The report of the Commonwealth Committee on Communication and the Media, Communication, society and development, was recently published by the Commonwealth Secretariat (Marlborough House, Pall Mall, London SW1Y 5HX, England). It will be on the agenda at the next Commonwealth meeting in August 1981. A summary of its main points and recommendations follows.

COMMUNICATION, SOCIETY, AND DEVELOPMENT

Communication is so much a part of our lives that its significance as an aspect of human effort and progress is often either taken for granted or simply ignored. Thus, communication and the media have only recently become a focus of attention at regional and international fora, after several other policy issues. Ironically, although communication-related matters become the subject of concerned discussion somewhat late in the day, it is left to communicators to disseminate the results of earlier enquiries on other issues.

This is indeed the true role of communicators: to serve as a focal point of messages imparting information and ideas, and to ensure that an interchange

takes place. Communication is a dynamic process that is more effective if it is participatory. It thus provides people with an opportunity to be directly associated with policy formulation and implementation, giving them a sense of commitment to national issues.

How many mistakes in social and economic development could have been avoided with better communication between planners and the people? The richness of people's experience, the value of established wisdom, the virtue of common sense — all this and more must go into the national meld if development plans and projects are to inspire and excite. None of this may occur, unless effective communication facilitates it.

Yet, there is a certain reluctance on the part of policymakers to concede that communication is a critical factor in development, or if they concede the point, a reluctance to follow through with action. Nor are systems devised and consistently used whereby the attitudes, reservations, and proposed changes of the people concerned are elicited and respected.

In the task of nation-building, therefore, many governments have as a primary requirement the need to draw such groups into the national communication system in order to enable them to participate actively in society, to identify with other groups and with the nation as a whole. The communication process must be broadened, strengthened, and diversified so that it is part of the structure of society and truly reflects its concerns. Then, communicators, serving as professional interlocutors and using whatever mode or level of technology is suited to their needs, can provide the necessary link between the centre and the periphery of society.

In most developing countries of the Commonwealth, there is a need for comprehensive communication policies as part of overall national planning. The need is strongest where the existing communication systems are inadequate and resources scarce. It is of particular importance in countries which have as a primary goal the task of

drawing several societies into one nation and generating a sense of national identity and consciousness.

MASS MEDIA

The mass media present developing countries with great opportunities and great challenges. Society can benefit from the potentially extensive reach of the media, not only in the process of development, but also in various other aspects of life, from farm news to weather reports to entertainment. But the media, like any other institution, do not develop or exist in a vacuum.

A part of society, they must reflect that society and be responsive to its needs and goals if they are to be relevant and durable.

By definition, the print media reach only the literate groups who tend to be largely urban elites. The literacy problem is compounded in many Commonwealth countries by the existence of several language groups. Despite these difficulties, the print media have an important role in promoting literacy. This can be advanced if they are adapted to the needs of the bulk of readers and adopt a format and style designed to promote reading interests.

Available data suggest that newspaper circulation relative to population has tended to decline slightly since 1970. In more than a few countries, this may be due to the growth of radio. It may also be affected by other economic factors like

price rises, or reflect that some readers find the newspapers unsuited to their taste.

Radio on the other hand, has been described as *the* medium of the people, reaching as it does across the barrier of literacy and limited in its potential penetration only by the availability of transmission equipment and radio receivers. It presents a general pattern of expansion. Nevertheless, despite the reduction in the cost of receivers, the spread of radio ownership remains small in several countries. Governments, in granting licenses for local production, should therefore give due consideration to the need to make radio sets available at prices that enable the widest possible diffusion of ownership.

The appeal of television is a reality and more and more countries are drawn to it. The potential value of television as a medium for education, for promoting development, as well as for information and entertainment is undeniable — but so are its higher cost and the uncertainties about its social and cultural impact. In this context, and with the potential for radio far from exhausted in most countries, the allocation of resources between radio and television bears careful consideration.

PUBLIC INFORMATION

Public information services are an important element of communication in many developing countries. Yet despite their range of duties — from

producing brochures to interpreting complex policies — public information officers are sometimes denied access to the totality of relevant information. There is often a failure to appreciate the importance of their role.

The overriding necessity is perhaps for governments to realize that if public information services are to be effective, they must not be considered merely as propaganda tools. Senior officials should be consulted at early stages of proposed policy changes, and their views sought on probable public reaction.

In most countries, the major international news agencies have dominated air time and column space for many years. The nature of these organizations deters them from covering many areas of news that are considered fundamental in developing countries. Many observers have noted that this situation often produces news coverage that neither reflects actualities, aspirations, or achievements in developing countries.

Without losing access to information provided by the major agencies, but with a view to covering neglected areas of news and giving such coverage a home-grown orientation, there has been a growing trend for the establishment of national news agencies or transnational news pools. Several constraints impede their establishment, however, including the cost of equipment and of telecommunications and a lack of specialist staff.

The shortage of appropriately qualified people is a pressing problem in communication development in most countries of the Commonwealth. Needed are programs for the enhancement of skills, more effective media application in the fields of health, agriculture, education, etc., the creation and sharing of training technology, and assistance in the development and management of training programs and institutions. These call for expanded, consistent, and concerted efforts in allocating appropriate resources, as a matter of public policy.

ACTION

In the belief that Commonwealth governments and peoples can benefit by recognizing the part that communication and media can play in assisting society by strengthening participatory democracy and helping to attain national goals, the Committee recommends that the professional status of communicators and their roles and responsibilities should be recognized and respected. Communication policy should receive attention as an integral part of national planning. Developing countries should accordingly give appropriate priority to the needs of the communication sector in their requests for external assistance and aid donors show a readiness to assist.

Further, the media should take the initiative in establishing links between

organizations in developed and developing countries. Staff in public information services should be aided to improve their expertise through opportunities for exchanging ideas and experiences.

The development of national news agencies should be promoted and governments should aid the flow of information between countries by adopting and extending concessionary telecommunications tariffs to the utmost extent possible.

The Committee also recommends that specific projects in the various areas of communication training, professional development, and the establishment of links between Commonwealth countries should be formulated by media organizations and governments. The Commonwealth Secretariat has a role to play in facilitating the exchange of information and materials.

Thus, the growing information needs of Commonwealth countries could be met and their capacity enlarged for freer, cheaper, better balanced, and more effective communication. □

The Commonwealth Committee on Communication and the Media was chaired by Ernest Corea, former Sri Lanka High Commissioner to Canada and presently Director, Cooperative Programs, IDRC.

Commentary provides a forum for readers to explore topics raised by Reports, or to present alternative perspectives, informed opinion, and analyses of development issues.

DESERT FORESTS

Peasant farmers and herders must now become foresters
if they and their environment are to survive

JEAN-MARC FLEURY

Axemaster. Firemaster. The names by which the settlers of the Sahel have gone down in history aptly describe their preferred methods of clearing land.

Fire, in particular, played a leading role in the original division of land. At a conference on the role of the trees in the Sahel (a report of which has just been published by IDRC†), El Hadj Sène, Director of water, forests, and wildlife of Senegal's Department of Rural Development, explained how a quarrelsome brother would set a fire, claiming the land it covered for his family. The tragedy is that in the Sahelian ecosystem, destabilized by drought, the methods used by the settlers of old may now serve to expand only one border, that of the Sahara, already the largest desert in the world.

No longer in need of axemasters or firemasters, the Sahel now requires different land developers whose role is diametrically opposed to that of their predecessors. The herder and the culti-

vator must come to terms with trees and become experts in reforestation. The scientists at the conference agreed that silviculture must be integrated into herding and agricultural practices if life in the Sahel is to continue. Unless the woody cover is regenerated, the Sahel's main resource, livestock, will disappear within 50 years or so. This is the pessimistic warning given by Henri Noël Le Houérou, then Director of research at the International Livestock Centre for Africa in Addis Ababa, in the report of the Dakar conference.

In normal conditions, the pastoral ecosystems of the Sahel provide for all the animals' needs. Most are characterized by an almost continuous cover of grass, trees, and shrubs that benefits both small and large ruminants. Although grass is a major part of the animal diet, the consumption of woody fodder (pods, leaves, and stalks) increases from five percent at the beginning of the dry season to 45 percent at the end (275 days), and accounts for

25 percent of the animals' food during the season. According to Mr Le Houérou, experiments conducted in Niger showed that cattle fed only grass throughout the dry season suffered seriously from vitamin A deficiency, including blindness. Grass that has been burnt and bleached by the sun for months on end has a crude protein content of only one to three percent, none of which can be digested by the animal. Straw is also deficient in phosphorus and carotene.

However, there is no shortage of forage trees and shrubs. Of the 120 species in the Sahel, 28 are preferred by the domestic ruminant and another 60 or so are occasionally consumed. The *cad* (*Acacia albida*) is perhaps the most obliging, as it retains its foliage throughout the dry season to lose it during the rainy season. Certain species of the *Salvadoraceae* family are true reservoirs: their leaves, branches, flowers, and fruits, all avidly sought by animals, contain 60 to 70 percent water. But the *Capparidaceae* family provides the richest fodder with 30 percent protein, while surviving the severest drought. The *Papilionoideae*, including *Pterocarpus lucens* — considered to be the most important species in the Sahel because of its ability to penetrate the arid soil — provide green fodder well into the second half of the dry season. Finally, the large family of *Mimosoideae*, including the *Prosopis* and *Acacia* species, plays a key role. The extraordinary *Acacia senegal* not only enriches the soil with nitrogen by producing pods and leaves rich in protein, but it also secretes gum arabic, which constitutes an important additional source of income. The experts that met in Dakar did not exclude the possibility of intro-



ducing exotic species to the Sahel, but they felt it was more important to promote indigenous species.

Herbaceous and woody cover have made life possible in the Sahel for generations, but prolonged drought coupled with excessive exploitation have forced the retreat of the woody stratum without which the herbaceous cover cannot survive. In the past 20 years, aerial photographs have shown that the woody cover in Chad and Mali has decreased by 32 and 22 percent respectively. Ground observations indicated an average tree mortality rate of 40 to 50 percent in the Sahel as a whole during the terrible drought of 1970-1973.

In areas where the mortality rate is 20 percent, the woody cover would regenerate in about 10 years if it was completely protected. But where 50 percent of the trees have died, it would take 30 years of total protection to return fodder production to its pre-1970 level. According to Mr Le Houérou, overexploitation is therefore more harmful than drought. Too many trees were felled or poorly pruned in an attempt to bring the foliage within reach of the animals. Roaming free, starving animals destroyed the seedlings and young growth. In some areas, the drought eliminated entire populations of species on the borderline of survival.

Without trees, the Sahel will be useless to livestock except during the 90-day rainy season. "At the current prices of meat and feed concentrates, we do not see how the animals can be fed economically for eight or nine months of the year," says Mr Le Houérou. Animal husbandry, the main industry of the Sahel, will be brought to a halt "most likely before the year 2030".

Thus, the next few years will be crucial for the Sahel. The conference participants concluded that the main problem is, first, to promote regeneration, and then the rational use of woody cover.

The priority for Oliver Hamel, Director of Senegal's National Centre for Forestry Research, is to lessen the pressure on natural populations by meeting needs for lumber, firewood, and charcoal with plantations of rapid-growth species such as eucalyptus. Preliminary research indicates that one hectare of eucalyptus plantation will produce approximately 10 cubic metres of wood per year, resulting in a saving of 50 hectares of Sahel forest. In November 1979, the forestry research centre began research on irrigated forest plantations within the framework of its program for the development of the Senegal river (see article on page 6). According to Mr Hamel, governments should simultaneously promote the exploitation of natural forests by favouring activities that will directly benefit rural populations — production of gum arabic, and reforestation to provide fodder, firewood, lumber, wood for carving and cover for game, pharmaceutical plants, and beekeeping. The villagers would be invited to consider wood produc-

tion as another type of agricultural operation by way of orchards and village or family woodlots. Demonstration programs would also lead to the re-introduction of trees into the agricultural landscape by establishing windbreaks, boundary hedges, and other methods of fighting erosion and revitalizing the soil. However, all these programs require the participation of the people.

The present situation is one of "generalized irresponsibility" toward the management of pastures and water resources, says Mr Le Houérou. Water and pastures are shared resources whereas the animals are private property. Thus, each individual seeks to maximize the use of resources for immediate profit without any concern for long-term effects.

In the past, management systems in the Sahel were established on a communal basis. Much smaller human and

animal populations lived in equilibrium with the environment. Even today, certain groups have preserved communal forests. Liberty Mhlanga, of the Environment Training program in Daka tells us of his 1979 visit to Boumdeid, small Mauritanian village, 600 km east of Nouakchott. No rain had fallen on the community of 2000 people between November and May. Located in the middle of the Sahel, Boumdeid is nonetheless still surrounded by a 30-hectare forest. Why had the inhabitants preserved the trees? A *marabout* (religious leader) had ordered it in the interests of the community.

When local communities have continued to manage their environment some have protected their trees. Generally, however, it is governments who have tried to manage the forests from their distant capitals or have encouraged access to private property from which the rural populations have not benefited. Papers contained in the report of the conference point to the need for administrative reforms that will return control of the land to communities. El Hadj Sène explains that the basic unit of the territorial reform under way in Senegal is the "rural community". This reform "gives people a certain amount of responsibility for the management of their affairs and especially for the distribution and use of the land." Mr Sène is convinced that the local people will take advantage of these changes to assert their responsibility for the development of their land, by increasing land investments, and by restoring the pastoral systems and community plantation.

Regardless of the researchers' and the population's good intentions, trees grow slowly and forestry projects are always long-term. But the people of the Sahel and Sudanic-Sahel (situated just south of the Sahel proper) have already greatly changed the African landscape in their attempt to protect certain trees. Thus, the presence in Upper Volta of the shea butter tree — which fruits after 20 years and reaches maturity at 50 to 100 years — indicates that we are in Mossi country. In the area inhabited by the Sérères of Senegal, among others, the *Acacia albida*, which fertilizes and protects crops in the dry season, dominates the horizon. In addition to the shea and *Acacia* parks, there are also the *Elaeis* (oil palm) park in Nigeria, the jujube park in Cameroun, the palmyra park in Casamance, Senegal, and the baobab park that often marks the site of a village.

This close relationship between people and species of trees, pointed out by Pierre Péliissier, professor at Paris X University, indicates the extent to which trees are an integral part of the life of populations in black Africa. The inhabitants of the Sahel certainly do not intend to be the first to exclude them. □

THE USEFUL TREE

Trees contribute greatly to life in the Sahel, including:

- proteins, vitamins, and minerals essential to herds during the eight to 10-month dry season;
- firewood and charcoal, which account for more than 90 percent of energy consumption in the Sahel;
- wood for construction, fencing, various tools, and utensils;
- fibre (rope) and foodstuffs (shea butter, baobab fruit, fruit and pods of other species);
- tanning products, medicine, dyes, gum arabic, and others;
- shade (production of grass is doubled under woody cover as opposed to full sunlight);
- protection of soil against water and wind erosion (the Sahara adds between 60 and 200 million tonnes of dust annually to the troposphere);
- increases in soil fertility and productivity (nitrogen) and maintenance of long-term equilibrium in the Sahelian ecosystems.

† *Le rôle des arbres au Sahel*: report of the conference held in Dakar, Senegal, from November 5 to 10, 1979. IDRC-159f, Ottawa, 1980.



FACTORY X

Serious management and economic problems plague public enterprises

Thailand imported all the gunnybag sacking needed by the rice and sugar industries until the Ministry of Industry decided to establish a gunnybag factory in 1949. Since then, many private firms have entered the market, and two more public factories have been set up by different government ministries.

Today, domestic gunnybag supply exceeds demand considerably, and many officials consider that the government gunnybag factory "X" serves no useful purpose. While they agree that it should either be sold or liquidated, no one has offered to buy the factory, and the government is loathe to stop its operations, as the problem of reemploying the workers has not been solved.

According to its managers, the factory's objectives are to provide employment, and prevent monopoly practices among private enterprises. Their personal objective for the factory is simply to survive.

Because of plans to ultimately dispose of the factory, the supervising ministry

has not set performance criteria, beyond suggesting that the factory should not expect financial support. This lack of funds has meant that the factory has not been able to modernize its equipment, now mostly 30 years old. And although some 40 weaving machines were bought 15 years ago, there are not enough spinning machines to feed them. A lack of spare parts and poor maintenance also means that many other machines lie idle. And while other factories are exporting bags and diversifying their products, Factory X cannot afford to do either.

Unlike all other gunnybag factories in the country that are located in the kenaf-growing area, Factory X is at some distance and must pay high transportation costs for its raw materials. This is all the more significant since its lack of working capital means it can only stock three days' worth of kenaf and must buy throughout the year, at ever-increasing prices.

Located in a metropolitan area, it is subject to minimum wage laws and

must pay its workers an average of 47 percent more than other factories, further reducing its profitability.

Management problems plague the enterprise: strategies for survival cannot be set because of government indecision about the factory's future; there is no manpower planning; staff recruitment is limited to internal announcements; there is a lack of training opportunities, aggravated by inadequate performance evaluations. Labour troubles are frequent, both between managers and between managers and workers. Labour productivity is low.

It is somewhat surprising that despite its problems, the factory has succeeded in minimizing its operating losses in recent years. It is still not making a profit, however, and its ability to pay current liabilities is low. Its present liquidity is high, largely because of a large inventory of unsold bags.

Clearly, Factory X is not succeeding in meeting its objectives of survival and self-sufficiency.

Michelle Hibler

THE STATE AS MANAGER

A.T.R. RAHMAN

Increasingly popular in many developing countries, public enterprises play a critical role in key sectors of the economy — utilities, industry, finance, and trade — contributing 10 to 15 percent of value added to the economy annually. Bangladesh, for example, has over 500 public enterprises in the industrial sector alone.

The rapid expansion of public enterprises in the past 25 years has not, however, been accompanied by research on their role or an assessment of their contribution to each country's development objectives. Because of the serious management and economic problems plaguing these enterprises, understanding, analyzing, and improving their performance is now a priority.

This is what researchers from eight Asian and four Caribbean countries set out to do in 1975 and 1976, with IDRC support. Now completed, the studies gathered information about the rationale behind public enterprises, their size, legal and administrative forms, control and management structures, and pattern of evolution.

GROWTH AND GOALS

Why and how the State takes on the role of manager or entrepreneur has been largely determined by the character and composition of the economic elite in each country, the nature of the political process, and by objective conditions. Thai and Philippine rulers, for example, established public enterprises in the 1930s to prevent control of basic utilities and services by Chinese and American capital.

The ideological outlook of political regimes does not guarantee a consistent approach to public enterprises, however, if actual socioeconomic circumstances require immediate action. For example, the nationalization of various private enterprises in India in the face of shutdowns, and the government sponsorship of several factories in Sri Lanka (then Ceylon) during the Second World War, are deviations from public policies in response to unexpected factors.

According to the researchers, the approach towards public enterprises in mixed economies will continue to be flexible. This flexibility has led to a changing of government positions on public enterprises. The analysis of this flexible approach shows that changes in the size and importance of public enterprises are not significant: they survive as important devel-

opment instruments and organizations, and efforts to improve their performance will receive high priority from policymakers.

The most serious problem affecting the management and performance of public enterprises is an incoherent goal structure. Seldom have the goals of public enterprises been clearly related to national goals. In many countries, public enterprises are being expanded without serious consideration of why, how, and to what extent they should be used in specific sectors. The creation of specific enterprises, often based on ad hoc decisions, is rarely preceded by a serious examination of their role in the national economy.

In some cases, the goals are articulated, but they blend social and economic objectives that often conflict with each other and no indication is given as to which should be emphasized at a given time. The presence of diverse goals — ranging from providing employment and creating self-reliance to enhancing national prestige — does not need to create problems, however, as long as the controlling agencies, managers, and clientele are aware of which are to be emphasized when, and second, what allowance is to be made for goal displacement in evaluating performance.

Several of the studies indicate that there is a great need to systematically examine alternate ways of achieving goals. They recommend that public enterprises as an economic policy

should be reassessed, that existing public enterprises be consolidated and brought under efficient management and control, and that any future expansion be preceded by a critical review of alternate policy instruments.

POLITICS, FINANCE, AND PEOPLE

Political interference reducing operational autonomy is also a major problem. In several cases it has been shown that public enterprises are being used for political patronage in the form of employment. This has resulted in increased labour costs.

Several financial problems face public enterprises: capital-debt-equity ratio, pricing policies, taxation, and investment policy. Different types of capitalization have been adopted by public enterprises, and the problems are mostly due to a lack of clear understanding between the government and the enterprise of how initial and operating capital are financed. The proliferation of public enterprises has also led to a dissipation of meagre resources.

It has also been noted that public enterprises' pricing and investment policies are seldom linked to their stated objectives. This had led to confusion of pricing criteria and, often, to an inappropriate performance assessment. It is well known that where commercial considerations dominate, pricing policies are based on cost plus profit. Where social considerations rule, pricing policies may be determined by such factors as purchasing power. Whatever the case



The role of public enterprise in development needs careful reassessment

may be, managers of public enterprises must be trained accordingly, and they should in turn keep detailed records of actual operating costs. But financial statements of public enterprises are often not kept up to date, making it difficult to obtain the data needed for timely managerial decisions.

The project reports and other studies show that no uniform management style and organization can be prescribed for public enterprises, as these must be adapted to local conditions. It is pointed out, nevertheless, that public enterprises, once established, should be managed and operated at the highest level of efficiency. While efficiency can be judged by profitability, there are independent yardsticks to evaluate performance: capacity utilization indicating input/output ratio, and production/consumption coefficients. It is recommended that public enterprises be encouraged to develop their own corporate plans in relation to sectorial and national plans.

Human resources are yet another constraint. Technical and managerial skills were found to be inadequate in many public enterprises. Additionally, it was seen that many managers and technicians did not have a clear understanding of the role and importance of public enterprises in the economy of their respective countries. Many reports suggest that as public enterprise managers and technicians are neither bureaucrats nor private enterprise employees, they should have their own ethics and operational styles. They therefore recommend that public enterprises have their own training, incentive, and motivation systems.

AUTONOMY AND ASSESSMENT

An important conclusion emerging from the studies is that incentives and autonomy are closely related to enterprise performance, and that non-monetary incentives are as important as monetary ones. For example, the interest manifested by the President of Korea and his Ministers in the productivity of public enterprises and in the selection of executives influences their performance. One can suggest that there is less tolerance of managerial inefficiency and ineffective leadership in Korea than in other countries studied.

A common finding in all the countries studied is that control structures affect management. Essentially, the primary control on management is expressed in the appointment of top managers. In many cases, government bureaucrats and military officials are granted these positions.

This has led to a conflict of interest, undesirable influence on the top management's behaviour, lack of managerial expertise, widespread risk-aversion, and managerial discontinuity.

It was also found that in almost all cases, the system for evaluating the efficiency and performance of management in public enterprises is inadequate. Each sector of society and every government department applies different criteria. Public enterprise managers, often under pressure from controlling agencies as well as from their clientele, tend to be confused. In many cases, they use the classic criteria of financial profitability, but in several cases, poor management is excused under the pretext of providing social benefits.



The difficulty in evaluating overall performance on the basis of the broad set of objectives with which public enterprises are entrusted has been shown to be fourfold. First, the order of priorities has not been specified, even in vague terms, by the government. Second, no attempt has been made at quantifying targets. Third, in spite of the contradiction between at least some of these objectives, the pertinent trade-offs are not stated. More important, the government has not committed itself to subsidizing enterprises pursuing noncommercial objectives. Finally, by expecting public enterprises to pursue national objectives, while placing undue stress on commercial profitability, they are sometimes made to disregard their main objective of satisfying society's needs.

What is needed at this stage is experimentation with selected approaches and methods for evaluating both management and enterprise performance. Such evaluations should also take into account the quality and efficiency of the public adminis-

tration system in which the enterprises are operating, as well as the efficiency and performance of private enterprises, preferably in the same sector.

NEEDS AND ACTION

The development of a senior management cadre that can provide a supply of trained, competent staff for middle and senior management positions in public enterprises and various controlling agencies is also a priority. But in most countries studied, the rapid expansion of public enterprises has not been accompanied by a comparable growth in training, research, and consultancy facilities. International and regional training and research institutions can play a major role in encouraging, supporting, and even initially undertaking activities towards the establishment of the needed facilities.

The research teams also recommend that four action research programs be carried out to improve public enterprises' performance. The first would seek to develop goal structures and integrate these goals at the national, sectoral, and specific enterprise levels. Experimental studies are also needed to see how public enterprises can be evaluated and what criteria and mechanisms can be used. Comparative studies of the efficiency of private and public enterprises in the same sector would yield guidelines for improving efficiency. Finally, a selective research program should be undertaken on various types of linkages between public enterprises and their controlling agencies to determine their impact on management and performance.

The major thrust for improving public enterprise management must come from national and sub-national institutions in each country. There is a role, however, for international and regional agencies in stimulating, encouraging, supporting, and complementing these activities. Various linkages — research networks, training programs, consultancies, technical assistance and exchange of staff, exchange of information, and regional and international association — can be established to support national, regional, and international institutions. In addition, international and regional institutions can serve as clearing houses for information about management processes and tools in other countries. □

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THE BANANA

FRUIT OR VEGETABLE?

JEAN-MARC FLEURY

On the fertile slopes of Mount Cameroon, squeezed between vast banana plantations, a few hundred plantain trees have found their place in the sun. Soon, the best of them will sally forth to begin the conquest of other regions of the country.

The banana occupies more hectares of land in Africa than on any other continent. In Cameroon, a country of the humid forest zone, the banana is the main agricultural product. The country exports 84 000 tonnes of bananas every year, while the inhabitants consume about one million tonnes. But the favourite banana of Cameroonians is not the variety they export.

For the inhabitants of temperate importing countries, the banana is essentially a fruit that is eaten raw, while in Africa, it is mainly a vegetable that is roasted or boiled. This is because the genus *Musa*, the botanical name for the banana, is divided into two groups: the banana fruits, and the plantain, whose starch-rich pulp is similar to that of tubers like potato.

In some regions of Uganda and Tanzania, people consume some four to four-and-a-half kilograms of plantains daily, often boiled or pounded into a paste. Other varieties are also used to make beer, or are cut into chips, dried, and kept for times of famine. In Cameroon, the per capita consumption averages 150 kg of plantains per year, and they are often eaten at more than one meal during the day.

Despite its importance, the plantain has been the subject of very little research in Africa. "As recently as five years ago, there was nothing being done on the plantain in Africa," affirms Tezenas du Montcell, agronomist in charge of the plantain project at the Institut de recherche agricole du Cameroun (IAR) at the Ekona research station, near Mt Cameroon. "No one has ever been concerned about it because it is not an export crop."

As a matter of fact, scientific work on this, the most important Cameroonian food crop, really started with the recruitment of the French researcher by the IAR, as part of a project financed by IDRC. At the moment, the varieties collected at the Ekona research station include some 50 cultivars — a cultivar being a variety that has been or is still used in agricultural production. "We now have the world's largest collection of plantain varieties," says Tezenas du Montcell, "all but a dozen or so."

The researchers' first objective is to better understand the plantain and its varieties, whose botanical classification is still confusing. They are also trying to increase the plantain's resistance to drought and improve yields, while preserving varieties with the most appealing flavour. At the moment, two varieties — "French Sombre" and "Njock Korn" — are particularly promising.

The *Musa*, which are gigantic grasses, develop from an underground rhizome or living root stock. Their stem is simply the result of the close entwining of the leaf sheaths, each of which ends in a tuft. A long flowering stalk sprouts from the middle of the stem once a year. Bending towards the soil, the flowers produce the bunch of bananas or plantains.

A plantain tree normally moves through three or four productive cycles of 12 to 14 months before it is replaced by a new plant. Each cycle begins with a young shoot sprouting from around the root, but sometimes the mother plant retards the shoot's growth, unduly prolonging the cycle. In Ekona, researchers are trying to make this cycle uniform and to gain a better mastery of harvest intervals, either by planting two suckers that will produce at six-month intervals, or by staggering planting times.

The plantain has also been tested in intercropping trials with groundnuts

and cocoyams. The results show that although the groundnut has a beneficial effect in eliminating weeds and fertilizing the soil, the cocoyam, by draining the soil of its nutrients, competes so strongly that plantain growth is set back three or four months.

The research conducted near Mount Cameroon is of great interest because plantain cultivation will increase significantly not only in Cameroon, but also in other countries. Cameroonian agronomists envisage that their country will soon be exporting plantains to Nigeria and Gabon. Large corporations are also following the research work very closely. The HEVECAM corporation, which is preparing 15 000 hectares of rubber plantations in Ocean province, hopes to cultivate plantain extensively to provide food for some 15 000 workers and their families. The Food Development Authority (MIDEVIV), has girdled Yaoundé with a plantain belt to supply food to the capital. Finally, in Gabon, there are plans for a commercial project of 200 hectares planted exclusively to plantain.

In the past, most families grew plantain in their household compounds. But with the rapid urbanization of African countries, a significant commercial market is developing. It is important then that both peasants and corporations cultivate the best varieties available if their efforts are to be rewarded.



New Chairman and governors

The new Chairman of IDRC's Board of Governors is the Honourable Donald S. Macdonald of Toronto, Canada. The secretary of State for External Affairs, Dr Mark MacGuigan, announced the appointment October 17.

A lawyer and former public servant, Mr Macdonald has held several portfolios during his long public service career, including Finance; Energy, Mines and Resources; and National Defence. At present, he is a partner with the law firm of McCarthy and McCarthy, Toronto.

Dr MacGuigan also announced the appointment of five new members to the IDRC Board. They are: Dr Frank A. DeMarco (Canada); Mr Francis Keppel (USA); Mr Felipe Herrera (Chile); Dr David Lawless (Canada); and Mr Marcel Massé (Canada). Three governors have been reappointed: Mr Norman T. Currie (Canada); the Hon. Rex Nettleford (Jamaica); and Sir Geoffrey Wilson (UK).

New director for Latin America

Dr L. Fernando Chaparro, a social scientist with special experience in science and technology policy research, has been appointed Regional Director of the IDRC Regional Office for Latin America and the Caribbean (LARO) in Bogota, Colombia. Dr Chaparro succeeds Dr Henrique Tono, the distinguished biochemist and university vice-rector who was LARO's first Regional Director.

Dr Chaparro graduated from Princeton University (USA) with a doctorate in Industrial Sociology. Since 1976, he has been the Deputy director of the Colombian Fund for Scientific and Technological Development (COLCIENCIAS) in Bogota. He has served as consultant to the United Nations on several occasions, and was the national coordinator of the IDRC-supported science and technology policy instruments project in Colombia.

Goats rehabilitated

The poor reputation of sheep and goats as "scourges of vegetation" and accomplices in the spread of the desert in Sahelian countries in Africa is well earned.

However, according to a bulletin from the International Livestock Centre for Africa that was summarized in a recent issue of the monthly *Afrique Agriculture*, it is all a vicious smear. In fact, sheep and goats appear to have been condemned in Africa mainly because they manage to survive in devastated areas... spoiled by cattle. The small ruminants are even said to play a positive role in environmental protection in humid areas: they control the growth of underbrush. Their relatively efficient use of the nutritional potential of grazing lands is becoming clear, and certain species of goats yield much more milk than native cows raised under the same conditions. Perhaps sheep and goats should be rehabilitated in official development policies.

... but not saved yet

Goats may be an endangered species for reasons other than their bad environmental reputation.

In India, people are consuming goat meat at such a rate that officials of the Central Institute for Research on Goats fear for its extinction on the subcontinent. The national goat herd is estimated to be 74 million — about one-fifth of the world's total — but the large-scale slaughtering that provides about 35 percent of the population's meat requirements has severely reduced the herd numbers. People are eating the small ruminants faster than they can reproduce.

The Central Institute proposes a sperm bank to preserve several breeds and restock herds through artificial insemination.

If goats should disappear, much hardship may be in store for rural people in India. Goats provide employment and support an estimated us.\$400 million a year business, according to the institute.

New ways with wastes

Disposing of industrial wastes is both an environmental problem and an economic one. Researchers in Taiwan have come up with a tidy solution by converting three such waste products into a useful, and profitable, material known as "red mud plastic" — or RMP.

Red mud is the messy by-product of aluminum production — for every tonne of aluminum there is a half-tonne of red mud. Enormous amounts of PVC (polyvinyl chloride) plastic

are discarded every year, and the stuff is almost indestructible except by burning, which produces dangerous fumes. Then there is used engine oil — tens of thousands of litres of it — presenting another environmental problem.

Researchers at Taiwan's Union Industrial Research Laboratories developed a process for converting these three leftovers into RMP, a tough, cheap polymer that resists the sun's heat and ultraviolet rays, and can withstand both acid and alkali. Made into sheets or moulded, it has dozens of uses, from solar collectors and biogas balloons, to storage buildings and aquaculture ponds.

Tsetse fly hangs in

Insecticides are still the only practical means of large-scale control of the tsetse fly, carrier of the disease trypanosomiasis (sleeping sickness), which renders a third of the African continent unfit for raising livestock.

Recognizing that insecticides can have adverse effects on the environment in the long run, the Food and Agricultural Organization (FAO) commission on animal trypanosomiasis in Africa nevertheless recommends that use of such control measures be intensified. Other control measures, such as raising and releasing male flies that have been sterilized by radiation in order to bring about a reduction in female fertility, have been attempted on a smaller scale. Raising the required

masses of tsetse flies presents difficult problems, however.

At the Bobo-Dioulasso research centre on animal trypanosomiasis in Upper Volta, 50 000 fertile females are fed daily on 400 rabbits and 60 guinea pigs in order to obtain an annual surplus of 250 000 males.

Researchers are striving to develop an artificial feeding method by supplying the flies with blood — gathered from living animals — through a silicone membrane.

The tsetse fly is still a particularly well-suited target for the new technique. The female has an eight- to 10-week lifespan, and produces, on the average, less than one larva a week. This exceptionally low fertility rate — for an insect — has not prevented infested regions from growing by more than 20 000 square kilometres in Cameroon and by 11 000 square kilometres in Zambia since the early 1950s.

An effective trypanosomiasis control program would contribute greatly to increasing food self-sufficiency in Africa, where there is now 10 percent less food per person than there was 10 years ago.

A little light protein

The lantern fish lives much of its life at the bottom of the sea. It is about the size of a sardine, looks like a tiny trout (it's related to both), and glows in the dark. But what is really interesting about the lantern fish is that it is so plentiful — it could become one of the world's biggest single sources of protein.

The little lantern fish was

generally ignored by the fishing industry until recently. Then a Norwegian research ship, sponsored by the United Nations in a program that involves 30 countries, discovered about 100 million tonnes of the lantern fish in the Arabian Sea. Given that the total world fish catch is less than 70 million tonnes annually, and that the lantern fish is found in all the world's major oceans, the discovery of such quantities of the fish could well lead to radical changes in the fishing industry, and a huge new protein resource for the developing world.

The project will continue to explore other regions, including the Indian Ocean, the Atlantic coast of Africa, and the South China Sea, while further studies are made of the life of the lantern fish, and the best ways to develop it as a food resource.

Development models

Many have proposed models for rural development in the Third World, but for the Commonwealth Science Council and The Acton Society Trust of Great Britain, the words have a literal meaning. They are advocating the use of models — scaled down, functioning versions of technological inventions — as a means of disseminating appropriate technologies.

Published in 1979, *Models for rural development* illustrates 17 simple technologies for generating energy, raising water, and farming. They are not by any means new inventions. Some, like the Himalayan water wheel, are

thousands of years old; others date from the European Middle Ages. But all are still in use in some parts of the world and could be more widely duplicated.

As innovator Jean Gimpel states in the introduction to the catalogue: "The model, being three-dimensional, has an incomparable advantage ... in that it is tactile. A non-specialist can operate the mechanisms until he has fully understood how it works; the model can be comprehended by any village craftsman; and it transcends all language barriers."

Further models, including negative educational models showing how *not* to do things, are in preparation. For information, write The Commonwealth Science Council, Marlborough House, Pall Mall, London SW1Y 5HX, Great Britain.

Hello, sunshine

Innovative telephones powered by solar energy will now link Jordan's isolated communities to the rest of the country. Each telephone is attached to an eight-metre-high cement post capped by panels of photovoltaic cells. Installed vertically — so as not to be used by birds for perches — the cells collect enough electrical energy to provide the equivalent of two hours of conversation. Telephone signals are relayed to powerful microwave antennas that retransmit them to national and international networks.

One hundred and thirty solar telephones have

already been installed. They were designed by engineer Samir Kawan, of the Royal Jordanian Scientific Society, in cooperation with an American firm.

Mayan mystery mapped

A new radar system designed to take pictures of the surface of the planet Venus has provided the answer to a 1000-year-old mystery. The ancient Mayan civilization of Central America numbered up to three million people at its most vigorous.

Archaeologists have studied it extensively, but no one has ever been able to figure out how the Mayans grew enough food to support so many people in a land consisting mainly of mountains and swamps.

Then NASA, the American space agency, tested its new radar system over the cloud-covered jungles of Guatemala, and the resulting "photos" showed what looked very like a grid of drainage canals under all that vegetation. Early this year two American archaeologists led an expedition to check out the new evidence, and discovered the overgrown remains of a highly sophisticated system of intensive agriculture based on a network of canals with raised fields.

They estimate some 14 000 square km of canals systems lie beneath the rain forests of Guatemala alone. NASA is now cooperating in taking more detailed pictures of the region. The implications for Guatemala, one of the world's poorest nations, are still being considered.



FARMERS

HAVE THE LAST WORD

Agronomists and filmmakers in Haiti are proving that agricultural extension must start with the farmers themselves

BERNARD MÉCHIN

For many countries, as they start the new decade, development remains little more than a theoretical concept. It may not even be farfetched to suggest that the only real growth they have experienced, notably in the last five or six years, has been in the levels of agricultural and food imports.

The great, and perhaps unrealistic hopes raised by the green revolution at the end of the 60s have since been dashed. Many agronomists and development experts have come to believe that this revolution amounted basically to little more than the export to an essentially tropical Third World of a technological agriculture modelled on that of temperate industrialized countries. The system was characterized by excessive mechanization and "chemicalization" and by use of varieties bred specifically for these conditions. The attempt to transfer this technology required imposing foreign ideas, attitudes, and approaches on the target countries. And because of the large capital investments needed, it automatically favoured large-scale operators and producers of export crops. The others, some 80 percent of farmers, found themselves more or less out of the picture.

But beginning in 1975-1976, a new wind began to blow through the international agricultural development doctrine — following on the early work of some authors and independent or community development workers. In various quarters, new thinking questioned the Euro-American modernization model previously advocated. Could such a heavy consumption of energy resources and nonrenewable raw materials really be extended or sustained on a world scale? Simultaneously, there was a shift from export crops to basic food crops in agricultural development programs, which began favouring the restoration of the rural economy and ecology. Both had suffered over-exploitation for the sole benefit of commercial producers. Restoring soil fertility and securing the ecological con-

ditions necessary to agricultural production became goals to ensure the survival of small farmers.

This shift in priorities, long recommended by independent experts from the large official agencies, leads naturally to agricultural development models that are locally based, highly diversified, closely adapted to existing conditions, and based on subsistence farming. Such models require relying on the farmer's experience and analyzing their production system, on the farm, in order to discover economical means of saving both farmers and their environment.

Only recently has any serious, concrete action been taken on this difficult program, so wide is the social and cultural gap that separates the peasant masses from development authorities.

An experiment, in many ways a pioneering effort, begun 10 years ago in Haiti, and stepped up in the last four years, well illustrates how complex, and how vital this systematic study of farmers' living conditions and cropping techniques really is.

Agriculture is the engine of the Haitian economy. It employs 85 percent of the population working a million hectares of land, and accounts for 80 percent of exports. However — and this is the crux of the problem — 80 percent of the cultivated area, which must feed the more than five million inhabitants, is located in the mountains and is not at all suited to the Euro-American style of agriculture or to irrigation, which is important in a tropical climate.

How is Haitian agriculture coping with the enormous problems it faces — a high population growth rate coupled with decreasing soil fertility and worsening erosion or drought, depending on the zone — in a situation now reaching crisis proportions? Is it anarchic, as many people seem to think? Or does it, as a group of agronomists in Haiti believe, represent a coherent production system based on rational farming methods?

After several years of patient obser-

Videotapes are used to provide a better understanding of subsistence farming in Haiti. From that understanding will come new, made-to-measure, agricultural programs. The approach hopes to avoid the unproductive conflicts of the past, when farmers were often pushed to adopt inappropriate or alien systems. Opposite page, clockwise from top: Gérald Belkin (centre, facing camera) in the fields of the Madian-Salagnac project area in Haiti. The video crew and farmers at work — surprisingly, the camera intrudes very little. In the fields or in households, all aspects of rural life were documented.

ation and daily contact with local farmers, agronomists at the Madian-Salagnac Agronomic Research and Rural Training Centre are convinced of the sound rationality of the farmers' production system and cultivation techniques. Established by the research service of the Haitian Department of Agriculture, the Madian-Salagnac Centre operates from atop the Rochelois plateau and covers an area transecting Haiti's southern peninsula. The area is typical of the country's different soil types, altitudes, and climatic conditions. Within this zone, at altitudes ranging from sea level to more than 1,000 metres, the Centre's researchers have focused their work on three regions, with very different physical environments and patterns of human settlements.

The patient field research carried out by the agronomists covers a wide scope. It has brought to light, in their opinion, a fundamental factor that most experts fail to recognize: the farmers' ability to adapt their techniques to meet changing needs. Instead of finding a static, outdated system at work, the research-

ers discovered that the farmers — far from resisting progress — seized every opportunity of improving productivity. Further, they were, by themselves, already modifying their methods to overcome constraints posed by the soil and the environment.

The examples are numerous. The Madian-Salagnac agronomists list a few that, they hope, may help combat some deep-rooted prejudices. Fallowing periods, for instance, vary enormously according to demographic pressure, soil fertility, and land tenure patterns, and not according to the farmers' laziness or ignorance. Similarly, it is population growth that determines whether new lands will be cultivated and land already cleared, planted more densely. Growing four or five different crops on one field — a practice that has been decried vehemently until very recently — has much to commend it, in fact. It makes optimal use of fertile soil and the staggered maturation and harvest times mean a more efficient use of labour. More importantly, different harvest times offer a hedge against the climatic uncertainties that the country

regularly experiences.

While practicing multiple cropping (see box), farmers will adjust plant density to the soil's decreasing fertility. For example, they might plant a far greater number of bean plants per hectare than the maximum density recommended. According to Didier Pillot, a member of the Madian-Salagnac team, this is because the roots do not develop well in infertile soils. The only presently available way of compensating for the loss in productivity is by making optimal use of soil and light through considerably denser plantings.

Agronomists have long questioned the farmers' refusal to plant in furrows, preferring their traditional method of planting in mounds. Once again, there is a simple, valid, explanation: mounds make it possible to concentrate organic matter — weeds, in particular — by burying it where it is needed. They also protect the soil from erosion and leaching while keeping between the mounds the water that would otherwise drain down the slope, washing away the more fertile topsoil. The results are conclusive: yields from mound-planted

WORKING TO THE LIMITS

The Haitian farmer uses many means to boost production and maintain soil fertility, despite the terrible handicaps that must be overcome. Mention has already been made of some of these farming methods (sowing in larger than normal quantities, mounds instead of furrows, crop association). There are a few others worth mentioning as well.

The land use system is an example. Generally, in areas where soil fertility is the major constraint, three major types of plots are cultivated on a single farm. Garden A, which is wooded, surrounds the family dwelling and is intensively planted to bananas, spices, coffee, avocados, and grapefruit, as well as large trees that provide shade, poles, and planks. In garden B, located beside garden A but not wooded, multiple cropping is practised — maize, beans, sweet potatoes, yams, cabbages, cassava, and so forth. Finally, there is garden C, which is some distance from the dwelling, and serves alternately as animal pasture and for crops such as beans, sweet potatoes, and sorghum.

The level of organic matter in garden A soils (seven to eight percent) is exceptionally high for such an environment. It is interesting, therefore, to see how the farmer restores fertility to soils already terribly impoverished. First, the farmer establishes and maintains a tree cover, then puts into service... the pig and a mobile kitchen. The area of the animal's enclosure is fertilized by its droppings and

continuous burrowing into the soil, as are those areas where the farmer sets up a kitchen. This is a small thatched hut, whose position is changed quite often. The soil is gradually enriched with all kinds of refuse and the potassium-rich ash of the cooking fire that is left behind.

In garden B, it is the transfers made by the farmer (some of the litter of the pigs and crop residues from C that are spread in B), or by the animal (feeding during the day in C and returned at night to B that maintain a relatively high ratio of organic matter (about five percent). Some farmers have developed another astute method for use in areas with rich limestone deposits: the limestone open kiln. On a circular area about four or five metres in diameter, they pile stones gathered from their fields, wood, and branches to a height of about one metre. They set the open kiln on fire and allow it to burn slowly for two or three days. The limestone disintegrates to become lime of excellent quality, which they use as cement in building their houses. The soil on which the kiln was located is improved by natural liming. This practice, previously common, is disappearing unfortunately because of the serious shortage of wood.

Finally, in garden C, only by fallowing and by pasturing animals can soil degradation be checked. Unfortunately, when the fallowing period is shortened (it is often less than 18 months), the soil is not able to com-

pletely regain its fertility. The farmer therefore focuses all efforts on gardens A and B.

Both in garden A — a real orchard developed to maximum productivity — and in the open gardens (B and C), the farmer uses know-how that enables him to combine the use of widely varied species (perennial or annual) and creates the environmental conditions most suitable for each.

Soil fertility is the basic factor governing farming practices in each plot. The management of the natural environment also takes into consideration many other factors specific to each plant species (development, maturity cycle, and so forth), and shows the complexity of the choices that the farmer has had to make. The result is a farming system geared to overcome the major environmental constraints: reduced fertility, high population growth, and excessive parcelling of land.

The Haitian farmer therefore uses his thorough knowledge of the environment and available crops to the fullest, in order to develop the potential of different soils, and overcome formidable production handicaps. This shows, according to the agronomists of Madian-Salagnac and the planners of the video communication project, the adaptability and soundness of this original system of agriculture, "developed from truly local methods and by that very fact, bringing hope and the possibility of solutions in difficult tropical conditions."

beans were found to be three times higher than those of plants between the mounds.

Just how rational the small farmers' agricultural production system is from both agronomical and ecological viewpoints has been systematically explored and documented in many ways by the Madian-Salagnac team. The high adaptability of a great many traditional farming methods is now recognized by numerous scientists and experts, including agricultural officials.

The reason standard solutions proposed to date have failed becomes obvious. Mechanization comes up against two major obstacles, besides topography: only by manual cultivation is it possible to concentrate organic matter under the mounds, a necessity for the intensive farming required by rapid population growth. Secondly, land use in this context leaves less and less room for animals and fodder crops. According to Vincent de Reynal, one of the Madian-Salagnac Centre agronomists, this is why the introduction of foreign plant material usually leads to failure, a failure that would have been foreseeable had it been known that the varied soils and climate require very well adapted, hardy varieties. Finally, fertilizer use is feasible only for farmers who are already well-off.

The solutions proposed by the Madian-Salagnac team are intended to alleviate the basic problems of decreasing soil fertility using other means. What they consider most appropriate are specific and seemingly modest, almost imperceptible, improvements that will not disrupt the delicate balance of the farmers' complex production system — introducing the raising of rabbits and leguminous fodder crops, planting hibiscus trees as windbreaks and for fodder, installing water tanks, and promoting local crops such as beans and yams.

The next problem for the Centre's team and the Haitian Department of Agriculture was to ensure the dissemination of research and educational material prepared by the various research centres and, more importantly, to promote the considerable knowledge acquired in the field. They very quickly felt the need to add a communication component to their agronomical research project, especially since it was moving steadily toward rural extension. This is how the video-communication project came to be launched by the Institute of Cultural Action for Development (ICAD) in 1979, spearheaded by the Madian-Salagnac research team, with the support of Haiti's Ministry of Agriculture, and under the auspices of the cooperative services of France's Ministries of Foreign Affairs and Co-operation. The project is also supported by IDRC and Oxfam-England, among others. It is part of a long-term global project of public education in agriculture financed mainly by the UNDP.

According to Mr Mathelier, head of the Department of Agriculture's plant

production service sponsoring the project, the idea is to use the extremely flexible tool of video to film occurrences and situations typical of all aspects of rural life in Haiti. To be used for information and education purposes, these include problems of water, soil fertility, and population growth; the farmers' reactions to these problems, to new techniques, and to various types of rural development; the value and originality of their traditional methods, their farming experience, and their sociocultural environment; and so forth.

Gérald and Paule Belkin, founders and directors of ICAD, have based their approach on the same principles that inspired the Madian-Salagnac agronomists. They believe "that no real education is possible in a rural region without an objective and thorough knowledge of existing agricultural practices, their flexibility, and their yield as determined by the constraints imposed by the environment and existing production and distribution systems; and, second, that only farmers whose confidence has been won before being questioned can accurately convey the

*As the project shows,
farmers are often
best qualified to teach
each other — and
the experts.*

reality of their farming experience and community life." Since the choices they make are almost always determined by factors that teachers and experts fail to take into account, it is essential, adds Paule Belkin, that "the instructors, researchers, and development workers gain practical field knowledge and have a thorough understanding of the reasoning and methods of those who have most at stake before they recommend improvements."

Gérald Belkin stresses that one of the project goals is "to encourage farmers to identify and assess their own methods, explain them, then compare them, in their own situation, with the modern techniques being suggested — often even pushed on them — in order to understand the possible benefits they could derive individually and collectively." Its chief characteristic is its integration in the environment and the willingness to show the results to those most concerned.

Through widespread dissemination of the information collected from farmers who have solved some of the problems they encountered, it should be

possible to help others modify their approaches and techniques. While sparing them from time-consuming and often disheartening trials and errors, the project also hopes the approach will avoid causing social and cultural upheavals or inducing passiveness and dependence. Farmers will learn from other farmers and, at the same time, teach the agronomists and all the others.

But wouldn't filming and recording intimidate or inhibit the farmers to some extent? Video equipment is, in fact, an extremely valuable means of communication and a rural extension tool that runs on batteries — there is usually no electricity in these regions — and can easily be transported by man or mule, so it can be used even in the remotest regions. It can thus, in the words of the ICAD project description: reach an isolated and largely illiterate population; communicate testimonies and information filmed live, expressed in the local language (Creole), and present them to an audience who can relate to the subjects as equals and who are experiencing similar problems. In addition, it introduces a self-observation mechanism that can strengthen the feeling that the development and improvement of the agricultural environment perhaps concerns a whole group, an entire social class.

Finally, it provides agricultural development and educational specialists with a remarkable training and documentation tool that they can easily include in their courses or extension programs. In this respect, the results already achieved are convincing. There are firm commitments in Haiti — in both the Department of Agriculture and the Faculty of Agronomy — to use this material to train agronomists and rural technicians and to disseminate through all of Haiti's rural areas. As a teaching instrument, it is already being used to reinforce and supplement the fieldwork that is now required for a second- and third-year agronomy students. The impact should be considerable, especially when one considers that, until very recently, it was not unusual for a student to receive a diploma without ever really having studied or worked on the land, or listened to what the farmers had to say.

The filming should be completed by December 1980. If ICAD obtains the funds it requires for selecting and producing the filmed documents and for dubbing them in French, English, and Spanish, the final product will be a twenty-odd-hour multilingual series, in black and white, and in colour, that examines highly diverse subjects.

The variety of microclimates and ecosystems in the Madian-Salagnac research region, together with their population density, are largely typical of many crisis situations in developing countries. There is no question that the project, although important to Haitians, far exceeds that strict geographical framework and could have numerous applications throughout the Third World.

MAJOR BOOK ON SORGHUM AND MILLETS

Sorghum and millets constitute a major source of energy and protein for millions of people in Asia and Africa. It is estimated that more than 70 million hectares are planted to these crops worldwide — more than the area devoted to maize — contributing some 100 million tonnes annually to the global food budget. They account for about 16 percent of world cereal consumption as food, and at least 25 percent in developing countries.

More than 500 million people in developing countries suffer from chronic undernourishment. Many of them live in semi-arid areas where the drought-tolerant sorghum

and millets are important food crops. The improvement of the yield potential as well as of the nutritive qualities of these grains could therefore make a valuable contribution to reducing malnutrition.

In the past 20 years, the yield potential of sorghum and millets has been raised substantially through the commercial use of hybrids. Considerable progress has also been made in incorporating resistance to major pests and diseases. The genetic upgrading of nutritive properties has, however, yet to receive integrated attention.

With the aim of furthering research in this area, Joseph H. Hulse, Evangeline Laing, and

Odette Pearson, all of IDRC, critically reviewed more than 1700 original references relating to the nature, composition, and nutritive value of these cereals. Their findings are published in *Sorghum and the millets: their composition and nutritive value*.

The book is more than a collection of references, as the analytical data used has been recalculated and presented in composite tables to make comparison easier. It is intended for agricultural scientists, biochemists, nutritionists, food scientists, and cereal chemists, particularly those working in developing countries and international research centres. It is hoped the text will also be

of interest to international development and technical assistance agencies that support food and agricultural research and development among countries of the Sahel and other regions of the semi-arid tropics.

The effect of genetic, environmental, and agronomic factors, of processing by traditional and mechanical means, and of the interrelationship of these cereals with other nutrient sources such as pulses are comprehensively reviewed. There is also a section on the effects of antinutritive factors, in particular the so-called "tannins" in sorghum, which discusses, for the first time, important new research findings on the nature and methods of analysis of these polyphenols.

Considerable detail is given as research workers in developing countries may have difficulty in gaining access to original papers. Also of value to researchers in different countries is the detailed appendix that relates numerous vernacular names to the generally-accepted Latin terms.

Sorghum and the millets: their composition and nutritive value, J.H. Hulse, E.M. Laing, and O.E. Pearson. Published July 1980 by Academic Press Inc. (London) Ltd., 998 pages. For information on ordering, please write: Communications Division, IDRC, P.O. Box 8500, Ottawa, Canada K1G 3H9



Sorghum in Ethiopia. Adding better nutritional quality to this hardy, drought-tolerant cereal would greatly benefit developing countries.

Nutritional status of the rural population of the Sahel: report of a working group, Paris, France, 28-29 April 1980. Published in January 1981, IDRC-160e.

Data on the diets and principal food sources of people living in the Sahelian semi-arid tropics are reviewed in this monograph. It includes a summary of information gathered, and recommendations for international and national research to improve the nutritional well-being of people of the area. (Also available in French, IDRC-160f.)

Rural energy in Fiji: a survey of domestic rural energy use and potential. Suliana Siwatibau. Published in January 1981, IDRC-157e.

This is the report of a project that surveyed current energy use and needs in selected rural areas of Fiji, and evaluated alternate sources of energy supply. An assessment is made of the merits of expanding the use of biogas, and the opportunities for improving domestic cooking conditions.

Science of the culture of freshwater fish species in China.

Compiled by the Committee for the Collection of Experiences in the Culture of Freshwater Fish Species in China. Published in January 1981, IDRC-TS16e, microfiche.

More than 1600 pages of text have been placed on microfiche to reproduce this translation from the Chinese. The publication details aquaculture procedures, construction speci-

fications, fish handling and breeding techniques, disease diagnosis and control methods, and many other aspects of the culture of seven major fish species grown in Southeast Asia and the tropics.

L'ostréiculture sous les tropiques. D.B. Quayle. Published in January 1981, IDRC-TS17f.

This publication is the French edition of a manual describing the basics of oysterculture. Profusely illustrated, the manual is intended for use by both researchers and field personnel. Contents cover biology and breeding, culture, feeding, harvesting, and equipment needs.

Teoría y práctica de la reproducción inducida en los peces. Brian J. Harvey y William S. Hoar. Published in December 1980, 48 pages, IDRC-TS21s

Spanish edition of a review of the practical application of the technique of hormonal manipulation to fish breeding, this publication summarizes recent advances in knowledge of the physiology and reproductive processes of cultured fish.

A review of teacher effectiveness research in Africa, India, Latin America, Middle East, Malaysia, Philippines, and Thailand: synthesis of results. Beatrice Avalos and Wadi Haddad. Published in December 1980, IDRC-TS23e.

This review identifies advances and gaps in knowledge about the effectiveness of teachers

as defined by researchers from seven geographic areas, and pinpoints the policy issues in each area. Concentration is on teacher selection, training, and on-the-job performance. (Also available in Spanish, IDRC-TS23s)

The determinants of school achievement: a review of the research for developing countries. Ernesto Schiefelbein and John Simmons. Published in December 1980, IDRC-TS24e.

This publication reviews the results of 26 studies on major determinants of cognitive student achievement – schooling characteristics, teachers' attributes, and student traits – and concludes with the implications for policy and research. (Also available in Spanish, IDRC-TS24s)

Rural water supply in China. Published in January 1981, IDRC-TS25e.

A manual on drilling, maintenance, and repair of wells for potable water, this is the translation and combination of five manuals used in the People's Republic of China. Chapters cover selection and protection of well sites, treatment, source improvement, and aspects of construction. More than 130 illustrations are included.

Science and technology for development. STPI Module 5: Policy instruments to build up an infrastructure for the generation of technology. Published in November 1980, IDRC-TS26e, 59 pages.

STPI Module 7: Policy instruments to define the pattern of demand for technology. Published in December 1980, IDRC-TS27e, 92 pages.

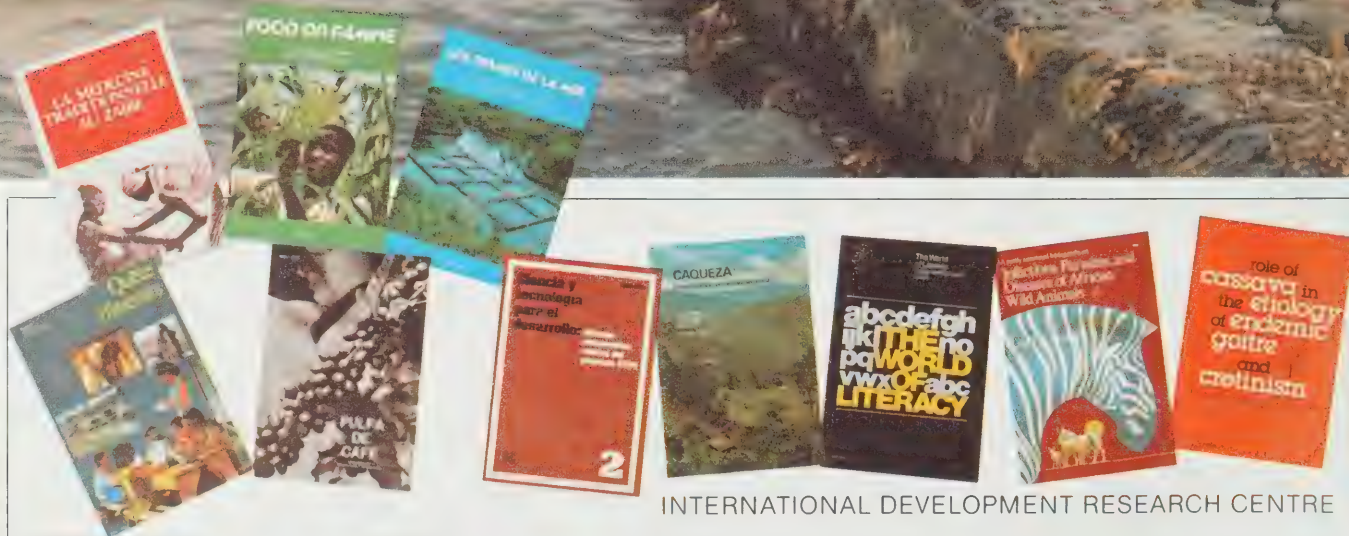
STPI Module 8: Policy instruments to promote the performance of S and T activities in industrial enterprises. Published in December 1980, IDRC-TS28e, 28 pages.

STPI Module 9: Policy instruments for the support of industrial science and technology activities. Published in January 1981, IDRC-TS29e.

These are the latest publications in a series of 12 modules containing the supporting material for the findings and assertions made in the Main Comparative Report of the Science and Technology Policy Instruments (STPI) Project (IDRC-109e), a large research effort that examined the design and implementation of science and technology policies in 10 developing countries.

Education, work and employment: a summary report. Maureen Woodhall. Published in December 1980, IDRC-TS30e.

Seven summary reviews and an overview examine the research undertaken into the relationship between education and employment in developing countries. Some of the main issues raised include education and worker productivity, the use of education in selection for employment, alternate methods of selection, and education and income distribution. (Also available in Spanish, IDRC-TS30s).



INTERNATIONAL DEVELOPMENT RESEARCH CENTRE



In addition to *The IDRC Reports*, the Centre publishes a wide range of material on development topics. These include scientific monographs, reports, and bibliographies on specific research areas, as well as general interest literature. The publications represent IDRC's interest and activities in agriculture, food and nutrition, population, health, information, and social sciences. Also available are a number of 16 mm films on IDRC-supported research and related

activities. A catalogue of currently available material is available on request.

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